D40S-7

D45S-7

D50C-7

D55C-7

D40SC-7

D45SC-7

D50SC-7

D55SC-7



SB2398E03 1, 2018

Operation & Maintenance Manual

D35S-7, D40S-7, D45S-7

D50C-7, D55C-7

FDB0J, FDB0K, FDB0L, FDB0M, FDB0N (D34NAP/D34P Tier-4)

D40SC-7, D45SC-7, D50SC-7, D55SC-7

FDB0P, FDB0Q, FDB0R, FDB0S (D34NAP/D34P Tier-4)

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2398E03

D35/40/45S-7, D50/55C-7, D40/45/50/55SC-7

Forklifts

Operation & Maintenance Manual

FORKLIFTS

D35S-7, D40S-7, D45S-7

D50C-7, D55C-7

FDB0J, FDB0K, FDB0L, FDB0M, FDB0N (D34NAP/D34P Tier-4)

D40SC-7, D45SC-7, D50SC-7, D55SC-7

FDB0P, FDB0Q, FDB0R, FDB0S (D34NAP/D34P Tier-4)

Original Instruction

This document is the informational asset of Doosan Corporation. Thus, unauthorized access, revision, distribution and copying of this document are strictly prohibited.

A WARNING

Do not start, operate or service this machine unless you have read and understood these instructions and received proper training.

Unsafe or improper use of the machine may cause serious injury or death.

Operators and maintenance personnel must read this manual and receive training before operating or maintaining the machine.

This manual should be kept with the machine for reference and periodically reviewed by the machine operator and by all personnel who will come into contact with it.

The following warning is provided pursuant to California Health & Safety Code Sections 25247.5 et, seq.

WARNING

California Proposition 65

Engine Exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

WASH HANDS AFTER HANDLING.

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Foreword

Literature Information

This manual should be stored in the operator's compartment in the literature holder or seat back literature storage area.

This manual contains safety, operation, transportation, lubrication and maintenance information.

Some photographs or illustrations in this publication show details or attachments that can be different from your lift truck. Guards and covers might have been removed for illustrative purposes.

Continuing improvement and advancement of product design might have caused changes to your lift trucks which are not included in this publication.

Read, study and keep this manual with the lift truck.

Whenever a question arises regarding your lift truck, or this publication, please consult your DOOSAN dealer for the latest available information.

Safety

The Safety Section lists basic safety precautions. In addition, this section identifies the text and locations of warning signs and labels used on the lift truck. Read and understand the basic precautions listed in the Safety Section before operating or performing lubrication, maintenance and repair on this lift truck.

Operator Restraint System (If Equipped)

This manual contains safety, operation and maintenance information for the DOOSAN operator restraint system. Read, study and keep it handy.

▲ WARNING

Your DOOSAN truck comes equipped with an operator restraint system. Should it become necessary to replace the seat for any reason, it should only be replaced with another DOOSAN operator restraint system.

Photographs or illustrations guide the operator through correct procedures of checking, operation and maintenance of the DOOSAN operator restraint system.

SAFE and EFFICIENT OPERATION of a lift truck depends to a great extent on the skill and alertness on the part of the operator. To develop this skill the operator should read and understand the Safe Driving Practices contained in this manual.

Forklift trucks seldom tipover, but in the rare event they do, the operator may be pinned to the ground by the lift truck or the overhead guard. This could result in serious injury or death.

Operator training and safety awareness is an effective way to prevent accidents, but accidents can still happen. The DOOSAN operator restraint system can minimize injuries. The DOOSAN operator restraint system keeps the operator substantially within the confines of the operator's compartment and the overhead guard.

This manual contains information necessary for Safe Operation. Before operating a lift truck make sure that the necessary instructions are available and understood.

Operation

The Operation Section is a reference for the new operator and a refresher for the experienced one. This section includes a discussion of gauges, switches, lift truck controls, attachment controls, transportation and towing information.

Photographs and illustrations guide the operator through correct procedures of checking, starting, operating and stopping the lift truck.

Operating techniques outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the lift truck and its capabilities.

Maintenance

The Maintenance Section is a guide to equipment care. The illustrated, step-by-step instructions are grouped by servicing intervals. Items without specific intervals are listed under "When Required" topics. Items in the "Maintenance Intervals" chart are referenced to detailed instructions that follow

Maintenance Intervals

Use the service hour meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc.) can be used instead of service hour meter intervals if they provide more convenient servicing schedules and approximate the indicated service hour meter reading. Recommended service should always be performed at the interval that occurs first.

Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the "Maintenance Intervals" chart might be necessary.

Perform service on items at multiples of the original requirement. For example, at "Every 500 Service Hours or 3 Months", also service those items listed under and "Every 10 Service Hours or Daily".

Environment Management

Note that DOOSAN CORPORATION INDUSTRIAL VEHICLE BG is ISO 14001 certified which is harmonized with ISO 9001. Periodic ENVIRONMENTAL AUDITS & ENVIRONMENTAL PERFORMANCE EVALUATIONS have been made by internal and external inspection entities. LIFE-CYCLÉ ANALYSIS has also been made through out the total ENVIRONMENT life MANAGEMENT SYSTEM includes DESIGN FOR ENVIRONMENT from the initial stage of the design.

ENVIRONMENT MANAGEMENT SYSTEM considers environmental laws & regulations, reduction or elimination of resource consumption as well as environmental emission or pollution from industrial activities, energy saving, environment-friendly product design (lower noise, vibration, emission, smoke, heavy metal free, ozone depleting substance free, etc.), recycling, material cost reduction, and even environmentally oriented education for the employee.

Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards, and use common sense. Persons must also have the necessary training, skills and tools before attempting to perform these functions.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "WARNING" as shown below.

WARNING

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning, explaining the hazard, can be either written or pictorially presented.

Operations that may cause product damage are identified by NOTICE labels on the product and in this publication.

DOOSAN cannot anticipate every possible circumstance that might involve a potential hazard, and common sense is always required. The warnings in this publication and on the product are therefore not all inclusive. Before any tool, procedure, work method or operating technique not specifically recommended by DOOSAN is used, you must be sure that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation. Iubrication. maintenance or repair procedures you choose.

The information, specifications, and illustration in this publication are on the basis of information available at the time it was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service given to the product. Obtain the complete and most current information before starting any job. DOOSAN dealers have the most current information available.

Safety

The safety rules and regulations in this section are representative of some, but not all rules and regulations that apply to lift trucks. Rules and regulations are paraphrased without representation that they have been reproduced verbatim.

Please refer to 29 CFR 1910.178 in the Code of Federal Regulations, the National Fire Protection Association No. American National (NFPA). Standards Truck Standards Development Institute/Industrial Foundation, ANSI/ITSDF B56.1 Safety Standard for Low lift and High Lift Trucks, UL 558 Fire Safety Standard for Internal Combustion Engine-Powered Industrial Trucks and subsequent revisions for a complete list of rules and regulations as to the safe operation of powered industrial lift trucks. Since regulations vary from country to country outside of U.S.A., operate this lift truck in accordance with local regulations.

DOOSAN lift trucks are manufactured in accordance with the National Fire Protection Association (NFPA) No. 505 and the American National Standards Institute, Inc. / Industrial Truck Standards Development Foundation (ANSI/ITSDF) B56.1, Safety Standard for Low and High Lift Trucks and, for European models, according to the regulations and standards laid down in EU Machinery Directive 2006/42/EC and EMC directive 2014/30/EU.

The most effective method of reducing the risk of serious injury or death to you or others is for you to know how to properly operate this lift truck, to be alert and to avoid actions or conditions that could cause accidents.

Do not operate a lift truck if it is in need of maintenance, repair or appears to be unsafe in any way. Report all unsafe conditions immediately to your supervisor, then contact your authorized lift truck dealer. Do not attempt any adjustments or repairs unless trained and authorized to do so.

Warning Signs and Labels

There are several specific safety signs on your lift truck. Their exact location and description of the hazard are reviewed in this section. Please take the time to familiarize yourself with these safety signs.

Make sure that you can read all warning and instruction labels. Clean or replace these labels if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc.

You must replace a label if it is damaged, missing or cannot be read. If a label is on a part that is replaced, make sure a new label is installed on the replaced part. See your dealer for new labels.

Training Required to Operate or Service Warning



Located on the front side of the FCU.

▲ WARNING

Improper operation or maintenance could result in injury or death. Do not operate or work on the lift truck unless you are properly trained. Read and understand the Operation and Maintenance Manual. Additional manuals are available from DOOSAN Lift Truck dealers.

This label also provides allowable lift truck capacity information.

General Warnings to Operator



Located on the right side of the operator's seat.

WARNING

Only trained and authorized personnel may operate this machine. For safe operation, read and follow the operation and maintenance Manual furnished with this lift truck and observe the following warnings:

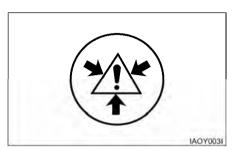
- 1. Before starting machine. Check all controls and warning devices for proper operation.
- Refer to machine identification plate for allowable machine capacity. Do not overload. Operate machines equipped with attachments as partially loaded machines when not handling a load.
- Put directional control or shift lever in neutral before "ON - OFF" switch is turned on.
- 4. Start, turn and brake smoothly. Slow down for turns, slippery or uneven surfaces. Extremely poor surfaces should be repaired. Avoid running over loose objects or holes in the roadway surfaces. Use extreme caution when turning on inclines.
- Travel with load as low as possible and tilted back. If load interferes with visibility, travel with load trailing.
- **6.** When operating on a slope, place the load side on the higher part of the slope.
- Watch out for pedestrians and obstructions. Secure enough clearance above the overhead guard so that it will not bump against anything in the truck's way.
- Do not permit a person to ride on forks or machine at any time.
- Do not allow anyone to stand or pass under the elevated portion of any machine.
- Make sure operating surface can safely support machine.
- Operate machine and attachments only from operator's position.

- 12. Do not handle unstable or loosely stacked loads.
- Use minimum tilt when picking up or depositing a load.
- Use extreme care when handling long, high or wide loads to ensure stability and durability of the truck.
- **15.** Forks should be completely under load and spread apart as far as load permits.
- 16. Machine should be equipped with overhead guard or equivalent protection. Where load requires it, use load backrest extension. Use extreme caution if operating without these devices.
- 17. After parking, lower the forks to the floor. Put directional control or shift lever in neutral. Set parking/secondary brake. Turn "ON OFF" switch off. Check wheels if machine is on incline. Disconnect battery when storing electric machines.
- Observe safety rules when handling fuel for engine powered machine and when changing batteries for electric machines.
- 19. Avoid overuse of the inching pedal as this may cause the automatic transmission oil to overheat or the clutch to slip. Do not use as a footrest or for long periods of time.
- 20. If user operates continuously pushing work or both brake pedal and accelerator pedal were depressed at the same time, it may cause the automatic transmission oil to overheat or the clutch to slip.

Pressure Warning

▲ WARNING

Contents under pressure may be hot. Allow to cool before opening.



Located on the radiator top tank by the radiator cap.

Hand Placement Warning

WARNING



No hands. Do not place hands in this area. Do not touch, lean on, or reach through the mast or permit others to do so.

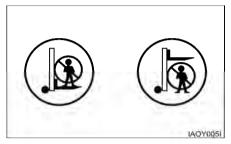


Located on the mast.

No Standing On Forks Warning, No Standing Under Forks Warning

WARNING

Do not stand or ride on the forks. Do not stand or ride on a load or pallet on the forks. Do not stand or walk under the forks.



Located on the lift cylinder.

Load Backrest Must Be In Place Warning

▲ WARNING

Operation without this device in place may be hazardous.

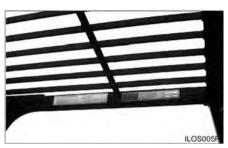


Located on the load backrest.

Overhead Guard Must Be In Place Warning

⚠ WARNING

Operation without this device in place may be hazardous. This guard conforms to A.N.S.I.B56.1 and F.E.M. Section IV. This design has been tested with an impact of (appropriate value).

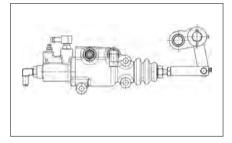


Located on the Overhead Guard.

Brake Pedal Adjustment Warning

WARNING

Improper adjustment could result in injury or death. It has to be adjusted by drawing dimension on free condition. For safe, don't unfasten clevis and nut. It has to be adjusted by trained personnel.



Located inside Brake pedal box.

Parking Brake



Pull the lever BACK to engage the parking brake.

Push the lever FORWARD to release the parking brake.

Applying the parking brake puts the transmission in NEUTRAL. The parking brake must be applied when leaving the lift truck and when starting the engine. If the operator leaves the seat without applying the parking brake an audible alarm will sound.



▲ WARNING

When leaving machine apply parking brake! Parking brake is not automatically applied. Alarm will sound if parking brake is not applied.

▲ WARNING

Correct adjustment is necessary to provide adequate braking. See the MAINTENANCE section for adjustment procedures. The lift truck may creep at engine idle and can cause damage, injury or death. Always apply the parking brake when leaving the lift truck. The parking brake is NOT automatically applied.

No Riders Warning

▲ WARNING

To avoid personal injury, allow no riders. A lift truck is designed for only one operator and no riders.



Located beside the operator's station.

Moving Fan Warning

WARNING

To avoid personal injury, stay clear of moving fan.

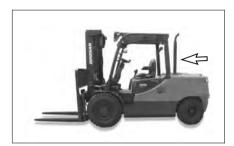


Located on the shroud and upper cover.

Hot Muffler Warning

WARNING

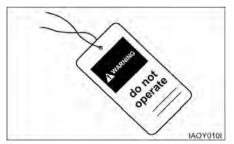
Be careful not to touch muffler because it's very hot when or after operating.





Located under muffler.

General Hazard Information



Attach a "Do Not Operate" or similar warning tag to start switch or controls before servicing or repairing the lift truck.

Do not start or service the lift truck when a "DO NOT OPERATE" or similar warning tag is attached to the start switch or controls.

Wear a hard hat, protective glasses and other protective equipment as required by job conditions.

Know the width of your attachments so proper clearance can be maintained when operating near fences, boundary obstacles, etc.

Do not wear loose clothing or jewelry that can catch on controls or other parts of the lift truck.

Keep the lift truck, especially the deck and steps, free of foreign material such as debris, oil tools and other items which are not part of the lift truck.

Secure all loose items such as lunch boxes, tools and other items which are not part of the lift truck.

Know the appropriate work-site hand signals and who gives them. Accept signals from one person only.

Always use the overhead guard. The overhead guard is intended to protect the lift truck operator from overhead obstructions and from falling objects.

A truck that is used for handing small objects or uneven loads must be fitted with a load backrest.

If the lift truck must be operated without the overhead guard in place due to low overhead clearance, use extreme care. Make sure there is no possibility of falling objects from any adjacent storage or work area. Make sure the load is stable and fully supported by the carriage and the load backrest extension (if equipped).

Do not raise loads any higher than necessary and never raise a load higher than 1830 mm (72 in) with the overhead guard removed.

Always use load backrest extension when the carriage or attachment does not fully support the load.

The load backrest extension is intended to prevent the load or any part of the load from falling backwards into the operator's station.

When operation the lift truck, do not depend only on flashing lights or back-up alarm (if equipped) to warn pedestrians.

Always be aware of pedestrians and do not proceed until the pedestrians are aware of your presence and intended actions and have moved clear of the lift truck and/or load.

Do not drive lift truck up to anyone standing in front of an object.

Obey all traffic rules and warning signs.

Keep hands, feet and head inside the operator station. Do not hold onto the overhead guard while operating the lift truck. Do not climb on any part of the mast or overhead guard or permit others to do so.

Do not allow unauthorized personnel to ride on the forks or any other part of the lift truck, at any time. When working in a building or dock, observe floor load limits and overhead clearances.

NOTICE

Inhaling Freon gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting Freon can cause bodily harm or death. Do not smoke when servicing air conditioners or wherever Freon gas may be present.

This Machine contains 0.4kg of HFC-134a, of which the CO2 equivalent value is 0.572 tons.

The GWP of HFC-134a is 1.430.

This is only for the trucks with air-conditioner option.

The above capacity information written on the film is attached to the truck.

Never put maintenance fluids into glass containers.

Use all cleaning solutions with care.

Do not use steam, solvent, or high pressure to clean electrical components.

Report all needed repairs.

When you handle DEF/ad-Blue, wear protective equipment and observe Precautions for Handling.



Inspect the part of the chain that is normally operated over the crosshead roller. When the chain bends over the roller, the movement of the parts against each other causes wears.

Inspect to be sure that chain link pins do not extend outside of the bore hole.

If any single link pin is extended beyond its connecting corresponding link, it should be suspected of being broken inside of its bore hole.

Inspect the chain anchor and the anchor links for wear.

Do not change any factory set adjustment values (including engine rpm setting) unless you have both authorization and training. Especially Safety equipment and switches may not be removed or adjusted incorrectly. Repairs, adjustments and maintenances that are not correct can make a dangerous operating condition.

For any checkup, repair, adjustments, maintenance and all other work concerning your forklift truck, please contact your DOOSAN dealer. We would like to draw your attention to the fact that any secondary damages due to improper handling, insufficient maintenance, wrong repairs or the use of other than original DOOSAN spare parts waive any liability by DOOSAN.

Operation Information

Mounting and Dismounting

Mount and dismount the lift truck carefully.

Clean your shoes and wipe your hands before mounting.

Face the lift truck when mounting and dismounting.

Use both hands face the lift truck when mounting and dismounting.

Use the handgrips for mounting and dismounting.

Do not try to climb on or off the lift truck when carrying tools or supplies.

Never get on or off a moving lift truck.

Do not use any controls as handholds when entering or leaving the operator's station.

Never get on or off a moving lift truck. Never jump off the lift truck.

Keep hands and steering wheel free of slippery material.

Before Starting the Lift Truck

Perform a walk-around inspection daily and at the start of each shift. Refer to the topic "Walk-around Inspection" in "Every 10 Service Hours or Daily" section of this manual

Adjust the seat so that full brake pedal travel can be obtained with the operator's back against the seat back.

Make sure the lift truck is equipped with a lighting system as required by conditions.

Make sure all hydraulic controls are in the HOLD position.

Make sure the direction control lever is in the NEUTRAL position.

Make sure the parking brake is engaged.

Make sure no one is standing and/or working on, underneath or close to the lift truck before operating the lift truck

Operate the lift truck and controls only from the operator's station.

Make sure the lift truck horn, lights, backup alarm (if equipped) and all other devices are working properly. Check for proper operation of mast and attachments.

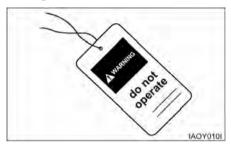
Pay particular attention to unusual noises or erratic movement which might indicate a problem.

Make sure service and parking brakes, steering, and directional controls are operational.

Make sure all personnel are clear of lift truck and travel path.

Refer to the topic "Lift Truck Operation" in the "Operation Section" of this manual for specific starting instructions.

Starting the Lift Truck



Do not start the engine or move any of the controls if there is a "DO NOT OPERATE" or similar warning tag attached to the start switch or controls.

Before Operating the Lift Truck

Test brakes, steering controls, horn and other devices for proper operation. Report faulty performance.

Do not operate lift truck until repaired.

Learn how your lift truck operates. Know its safety devices. Know how the attachments work.

Before moving the lift truck, look around. Start, turn and brake smoothly.

An operator must constantly observe his lift truck for proper operation.

Operating the Lift Truck

Always keep the lift truck under control.

Obey all traffic rules and warning signs.

Never leave the lift truck with the engine operating, or with the parking brake disengaged.

Operate the engine only in a well ventilated area.

Lower a mast, with or without load, before turning or traveling. Tip over could result. Watch out for overhead obstructions.

Always observe floor load limits and overhead clearance.

Start, turn, and brake smoothly, slow down for turns, grades, slippery or uneven surfaces.



Use special care when operation on grades. Do not angle across or turn on grades. Do not use lift truck on slippery grades. Travel with forks downgrade when unloaded. Travel with load uporade.

Do not overload, or handle offset, unstable, or loosely stacked loads. Refer to load capacity plate on the lift truck. Use extreme caution when handing suspended, long, high or wide load.



Tilt elevated load forward only when directly over unloading area and with load as low as possible.

Do not stunt ride or indulge in horseplay.

Always look and keep a clear view of the path of travel.

Travel in reverse if load or attachment obstructs visibility.

Use extreme caution if visibility is obstructed.

Stay in designated travel path, clear of dock edges, ditches, other drop-offs and surfaces which cannot safely support the lift truck.

Slow down and use extra care through doorways, intersections and other location where visibility is reduced.

Slow down for and avoid pedestrians, other vehicles, obstruction, pot holes and other hazards or objects in the path of travel.

Always use overhead guards except where operation conditions do not permit. Do not operate lift truck in high stacking areas without overhead guards.

When stacking, watch for falling objects. Use load backrest extension and overhead guard.

Refer to the topic "Operation Techniques" in the "Operation Section" of this manual.

Loading or Unloading Trucks/Trailers

Do not operate lift trucks on trucks or trailers which are not designed or intended for that purpose. Be certain truck or trailer brakes are applied and wheel chocks in place (or be certain unit is locked to the loading dock) before entering onto trucks or trailers.

If trailer is not coupled to tractor, make sure the trailer landing gear is properly secured in place. On some trailers, extra supports may be needed to prevent upending or corner dipping.

Be certain dock plates are in good condition and properly placed and secured. Do not exceed the rated capacity of dock boards or bridge plates.

Lift Truck Parking

When leaving the operator station, park the lift truck in authorized areas only. Do not block traffic.



- Park the lift truck on level ground, lowering the fork and tilting the mast forward until the fork tips touch the floor.
- Move the direction control lever to NEUTRAL.
- · Engage the parking brake.
- Turn the key switch off and remove the key.
- Turn the disconnect switch to OFF and remove the key (if equipped).
- Do operate the disconnecting switch after 30 seconds from start key-off. (if equipped)
 Otherwise Engine Control Unit (ECU) can be damaged.
- Block the drive wheels when parking on an incline.

Maintenance Information

Perform all maintenance unless otherwise specified as follows:

- · Park the lift truck in authorized areas only.
- Park the lift truck on level ground, lowering the fork and tilting the mast forward until the fork tips touch the floor.
- Place the transmission controls in neutral.
- Engage the parking brake.
- Stop the engine.
- Remove the start switch key and turn the disconnect switch OFF (if equipped).
- Block the drive wheels when parking on an incline.

Pressure Air

Pressure air can cause personal injury. When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Fluid Penetration

Always use a board or cardboard when checking for a leak. Escaping fluid under pressure, even a pinhole size leak, can penetrate body tissue, causing serious injury, and possible death. If fluid is injected into your skin, it must be treated by a doctor familiar with this type of injury immediately.

Crushing or Cutting Prevention

Support equipment and attachments properly when working beneath them. Do not depend on hydraulic cylinders to hold it up. Any attachment can fall if a control is moved, or if a hydraulic line breaks.

Never attempt adjustments while the lift truck is moving or the engine is running unless otherwise specified.

Where there are attachment linkages, the clearance in the linkage area will increase or decrease with movement of the attachment

Stay clear of all rotating and moving parts.

Keep objects away from moving fan blades.

They will throw or cut any object or tool that falls or is pushed into them.

Do not use a kinked or frayed wire rope cable. Wear gloves when handling the wire rope cable.

Retainer pins, when struck with force, can fly out and

injure nearby persons. Make sure the area is clear of people when driving retainer pins.

Wear protective glasses when striking a retainer pin to avoid injury to your eyes.

Chips or other debris can fly off objects when struck. Make sure no one can be injured by flying debris before striking any object.

Falling Objects Protective Structure(FOPS)

This is an attached guard located above the operator's compartment and secured to the lift truck.

To avoid possible weakening of the Falling Objects Protective Structure (FOPS), consult a DOOSAN dealer before altering, by adding weight to, welding on, or cutting or drilling holes into the structure.

The overhead guard is not intended to protect against every possible impact. The overhead guard may not protect against some objects penetrating into the operator's station from the sides or ends of the lift truck.

The lift truck is equipped with an overhead guard and FOPS as standard. If there is a possibility of overhead objects falling through the guard, the guard must be equipped with smaller holes or a Plexidlas cover.

Any altering done that is not specifically authorized by DOOSAN invalidates DOOSAN's FOPS certification.

The protection offered by this FOPS will be impaired if it has been subjected to structural damage.

Structural damage can be caused by an overturn accident, by falling objects, etc.

Do not mount any item such as fire extinguishers, first aid kits and lights by welding brackets to or drilling holes in any FOPS structure. See your DOOSAN dealer for mounting guidelines.

Burn Prevention

Coolant

At operating temperature, the engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot water or steam. Any contact can cause severe burns.

Steam can cause personal injury.

Check the coolant level only after engine has been stopped and the filler cap is cool enough to remove with your bare hand.

Remove the cooling system filter cap slowly to relieve pressure.

Cooling system additive contains alkali that can cause personal injury. Avoid contact with the skin and eyes and do not drink.

Allow cooling system components to cool before draining.

Oils

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact the skin.

At operation temperature, the hydraulic tank is hot and can be under pressure.

Remove the hydraulic tank filter cap only after the engine has been stopped and the filter cap is cool enough to remove with your bare hand.

Remove the hydraulic tank filter cap slowly to relieve pressure.

Relieve all pressure in air, oil fuel or cooling systems before any lines, fittings or related items are disconnected or removed.

Batteries

Batteries give off flammable fumes which can explode.

Do not smoke when observing the battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear protective glasses when working with batteries.

Fire or Explosion Prevention

All fuels, most lubricants and some coolant mixtures are flammable.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Do not smoke while refueling or in a refueling area.

Do not smoke in areas where batteries are charged, or where flammable materials are stored.

Batteries in series can be located in separate compartments.

When using jumper cables always connect positive(+) cable to positive(+) terminal of battery connected to starter solenoid and negative(-) cable from external source to starter negative(-) terminal.

(If not equipped with starter negative(-) terminal, connect to engine block.)

See the Operation Section of this manual for specific starting instructions.

Clean and tighten all electrical connections. Check daily for loose or frayed electrical wires. Have all loose or frayed electrical wires tightened, repaired or replaced before operation the lift truck.

Keep all fuels and lubricants stored in properly marked containers and away from all unauthorized persons.

Store all oily rags or other flammable material in a protective container, in a safe place.

Do not weld or flame cut on pipes or tubes that contain flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them.

Remove all flammable materials such as fuel, oil and other debris before they accumulate on the lift truck.

Do not expose the lift truck to flames, burning brush, etc., if at all possible.

Shields, which protect hot exhaust components from oil or fuel spray in the event of a line, tube or seal failure, must be installed correctly.

Do not operate in areas where explosive gases exist or are suspected.

Fire Extinguisher

Have a fire extinguisher-type BC and 1.5KG minimum capacity-on rear overhead guard leg with latch and know how to use it. Inspect and have it serviced as recommended on its instruction plate.

Ether

Ether is poisonous and flammable.

Breathing ether vapors or repeated contact of ether with skin can cause personal injury.

Use ether only in well-ventilated areas.

Do not smoke while changing ether cylinders.

Use ether with care to avoid fires.

Do not store replacement ether cylinders in living areas or in the operator's compartment.

Do not store ether cylinders in direct sunlight or at temperatures above 39°C (102°F).

Discard cylinders in a safe place. Do not puncture or burn cylinders.

Keep ether cylinders out of the reach of unauthorized personnel.

Lines, Tubes and Hoses

Do not bend or strike high pressure lines. Do not install bent or damaged lines, tubes or hoses.

Repair any loose or damaged fuel and oil lines, tubes and hoses. Leaks can cause fires. Contact your DOOSAN dealer for repair or replacement.

Check lines, tubes and hoses carefully. Do not use your bare hand to check for leaks. Use a board or cardboard to check for leaks. See Fluid Penetration in the Safety Section for more details. Tighten all connections to the recommended torque. Replace if any of the following conditions are found.

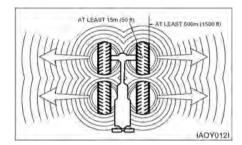
- End fittings damaged or leaking.
- Outer covering chafed or cut and wire reinforcing exposed.
- · Outer covering ballooning locally.
- Evidence of kinking or crushing of the flexible part of hose.
- · Armoring embedded in the outer cover.
- · End fittings displaced.

Make sure that all clamps, guards and heat shields are installed correctly to prevent vibration, rubbing against other parts, and excessive heat during operation.

Tire Information

Explosions of air-inflated tires have resulted from heatinduced gas combustion inside the tires. The heat, generated by welding or heating rim components, external fire, or excessive use of brakes can cause gaseous combustion.

A tire explosion is much more violent than a blowout. The explosion can propel the tire, rim and axle components as far as 500 m (1500 ft) or more from the lift truck. Both the force of the explosion and the flying debris can cause personal injury or death, and property damage.



Do not approach a warm tire closer than the outside of the area represented by the shaded area in the above drawing.

Dry $nitrogen(N_2)$ gas is recommended for inflation of tires. If the tires were originally inflated with air, nitrogen is still preferred for adjusting the pressure. Nitrogen mixes properly with air.

Nitrogen inflated tires reduce the potential of a tire explosion, because nitrogen does not support combustion. Also, nitrogen helps prevent oxidation and the resulting deterioration of rubber and corrosion of rim components.

Proper nitrogen inflation equipment and training in its use are necessary to avoid over-inflation. A tire blowout or rim failure can result from improper or misused equipment.

Stand behind the tread and use a self-attaching chuck when inflation a tire.

Servicing, changing tires and rims can be dangerous and should be done only by trained personnel using proper tools and procedures. If correct procedures are not followed while servicing tires and rims, the assemblies could burst with explosive force and cause serious personal injury or death. Follow carefully the specific information provided by your tire or rim servicing personnel or dealer.

Operator Restraint System (If Equipped)

Warning Signs and Labels

Your DOOSAN lift truck has the following tipover warning decals.

Make sure that you can read all safety signs. Clean or replace these if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc. You must replace a label if it is damaged, missing or cannot be read. If a label is on a part that is replaced, make sure a new label is installed on the replaced part. See you DOOSAN Lift Truck dealer for new labels.

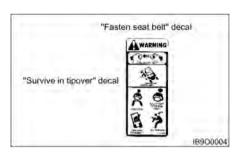
The most effective method of preventing serious injury or death to yourself or others is to familiarize yourself with the proper operation of the lift truck, to be alert, and to avoid actions or conditions which can result in an accident.

▲ WARNING

Tipover can occur if the truck is improperly operated. In the event of a tipover, injury or death could result.







The "Survive in tipover" warning is located on the overhead guard. It shows the proper use of the operator restraint system.

Seat Adjustment





Move the lover, slide the seat to the desired position, and release the lever.

Adjust the seat before operating the lift truck. After adjusting, set the seat to make sure it is properly locked. Do not adjust the seat while the truck is in motion.

WARNING

Do not pace your hand or fingers under the seat. Injury may occur as the seat moves up and down.

If Optional Suspension Seat (weight adjusting type) Equipped

Forward and Backward Adjustment

The seat can be adjusted by pushing the lever on the right side of seat.





Adjust the seat before operating the lift truck. After adjusting, set the seat to make sure it is properly locked. Do not adjust the seat while the truck is in motion.

Weight adjustment

Pull the weight adjustment lever upwards and move right or left side.

Adjust to driver's weight in 7 steps (50 ~ 110 kg)

NOTICE

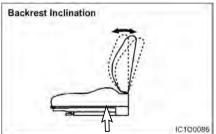
Do not place your hand or fingers under the seat. Injury may occur as the seat moves up and down.



Backrest Inclination

The backrest angle can be adjusted by using the lever on the left side of seat.

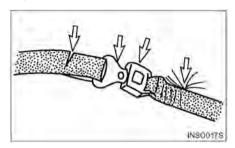




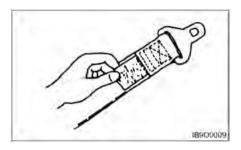
Seat Belt

The Operator Restraint System, Prevents the operator from jumping from the operator's compartment in the event of a forward or side tipover. The system is designed to keep the operator on the seat and in the operator's compartment in the event of a tipover.

Inspection



 If the seat belt is torn, if pulling motion is interrupted during extension of the belt, or if the belt cannot be inserted into the buckle properly, replace the seat belt assembly.



2. Belt Maintenance – Every 500 service hours. Check that the belt fastening works properly and that winding device is free from run lock when jerked. Check that the belt is suitably fastened to the seat. Check that the seat is correctly secured to the hood and the chassis. On visual inspection, fastenings must be intact, otherwise, contact the safety manager.

WARNING

Your DOOSAN truck comes equipped with a DOOSAN operator restraint system. Should it become necessary to replace the seat for any reason, it should only be replaced with another DOOSAN operator restraint system.



In the event of a tipover, the seat and restraint system should be inspected for damage and replaced, if necessary.

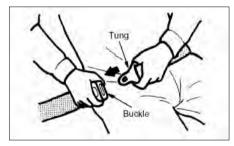
NOTE: Operator restraints shall be examined at the regular truck service intervals. It is recommended that they be replaced if any of the following conditions are found:

- Cut or frayed strap
- Worn or damaged hardware including anchor points
- Buckle or retractor malfunction
- Loose stitching

WARNING

The seat belt may cause the operator to bend at the waist. If you are pregnant or have suffered from some abdominal disease, consult a doctor before you use the seat belt.

Fasten the Seat Belt

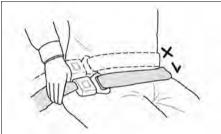


- Grip the plate (connector) of the belt and pull the belt from the retractor. Then insert the plate into the slot of the buckle until a snap is heard. Pull on the belt to confirm it is latched.
- 2. Make sure the belt is not twisted.

WARNING

If you fasten the belt across your abdomen, the belt may injure your abdomen in an accident.

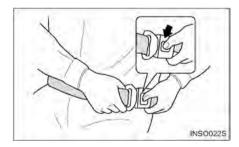




3. Be sure to fasten the belt across your hips, not across your abdomen.

NOTE: The belt is designed to automatically adjust to your size and movement. A quick pull on the belt will confirm that the automatic adjuster will hold the belt position in the event of an accident.

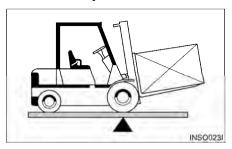
Release the Seat Belt



Push the button of the buckle to release the belt. The belt will automatically retract when released. Hold the plate of the belt and allow the belt to slowly retract.

Avoiding Lift Truck Tipovers

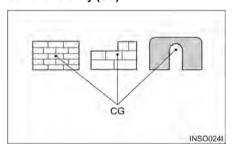
Lift Truck Stability



Counterbalanced lift truck design is based on the balance of two weights on opposite sides of a fulcrum (the front axle). The load on the forks must be balanced by the weight of the lift truck.

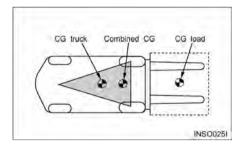
The location of the center of gravity of both the truck and the load is also a factor. This basic principle is used for picking up a load. The ability of the lift truck to handle a load is discussed in terms of center of gravity and both forward and sideways stability.

Center of Gravity (CG)



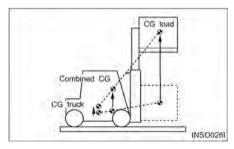
The point within an object, at which the whole weight of the object may be regarded as being concentrated, is called the center of gravity or CG. If the object is uniform, its geometric center will coincide with its CG. If it is not uniform, the CG could be at a point outside of the object. When the lift truck picks up a load, the truck and load have a new combined CG.

Stability and Center of Gravity



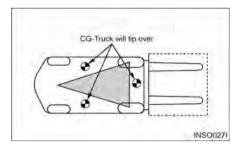
The stability of the lift truck is determined by the location of its CG; or, if the truck is loaded, the combined CG of the truck and load. The lift truck has moving parts and, therefore, has a CG that moves. The CG moves forward or backward as the mast is tilted forward or backward. The CG moves up or down as the mast moves up or down. The CG and, therefore, the stability of the loaded lift truck, is affected by a number of factors such as:

- the size, weight, shape and position of the load
- the height to which the load is lifted
- · the amount of forward or backward tilt
- tire pressure
- dynamic forces created when the lift truck is accelerated, braked or turned
- condition and grade of surfaces on which the lift truck is operated



These same factors are also important for unloaded lift trucks. They tip over sideways easier than a loaded lift truck carrying its load in the lowered position.

Lift Truck Stability Base

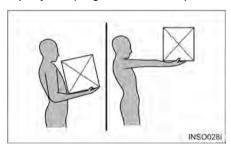


For the lift truck to be stable (not tip over forward or to the side), the CG must stay within the area of the lift truck stability base - a triangular area between the front wheels and the pivot of the steer wheels. If the CG moves forward of the front axle, the lift truck will tip forward. If the CG moves outside of the line on either side of the stability base, the lift truck will tip to the side.

▲ WARNING

Dynamic forces (braking, acceleration, turning) also affect stability and can produce tipover even when the CG is within the stability triangle.

Capacity Load (Weight and Load Center)



The capacity load of the lift truck is shown on the capacity/nameplate riveted to the truck. It is determined by the weight and load center. The load center is determined by the location of the CG of the load.

The load center shown on the nameplate is the horizontal distance from the front face of the forks, or the load face of an attachment, to the CG of the load.

The location of the CG in the vertical direction is the same as the horizontal dimension.

Remember that, unless otherwise indicated, the capacity load shown on the nameplate is for a standard lift truck with standard backrest, forks and mast, and having no special-purpose attachment. In addition, the capacity load assumes that the load center is no further from the top of the forks than it is from the face of the backrest. If these conditions do not exist, the operator may have to reduce the safe operating load because the truck stability may be reduced. The lift truck should not be operated if its capacity/nameplate does not indicate capacity load.

NOTE: If the load is not uniform, the heaviest portion should be placed closer to the backrest and centered on the forks.

NOTICE

- Capacity/Nameplates originally attached to forklifts sold by DOOSAN shall not be removed, altered or replaced without DOOSAN's approval.
- DOOSAN assumes no responsibility for lift trucks placed in service without a valid DOOSAN Nameplate.
- If necessary to change your specification, contact your DOOSAN lift truck dealer.

Safety Rules



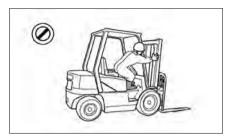
Only properly trained and authorized personnel should operate forklift trucks. Wear a hard hat and safety shoes when operating a lift truck. Do not wear loose clothing.



Inspect and check the condition of your forklift truck using the operator's check list before starting work. Immediately report to your supervisor any obvious defects or required repairs.



Do not operate your truck in unauthorized areas. Know your forklift truck and think safety. Do not compromise safety. Follow all safety rules and read all warning signs.



Do not operate a lift truck unless you are in the operator's seat. Keep hands and feet inside the operator's compartment. Do not put any part of the body outside of the operator's compartment. Never put any part of body into the mast structure or between the mast and the truck



Do not start, stop, turn or change direction suddenly or at high speed. Sudden movement can cause the lift truck to tip over. Slow the speed of your truck and use the horn near comers, exits, entrances, and near people.

In case of a truck with the steering knob, Do not operate the steering knob suddenly, to prevent accident caused by quick turning.



Never operate a lift truck with wet hands or shoes. Never hold any controls with grease on your hands. Your hands or feet will slide off of the controls and cause an accident.



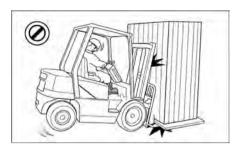
Do not raise anyone on the forks of your lift truck. Do not let other people ride on the truck. Lift trucks are designed to carry loads, not people.



Do not operate your truck without the load backrest extension and overhead guard. Keep the load against the backrest with the mast tilted backward.



Do not lift or move loads that are not safe. Do not pick up an off center load. Such a load increases the possibility of a tipover to the side. Make sure loads are correctly stacked and positioned across both forks. Always use the proper size pallet. Position the forks as wide as possible under the load. Position loads evenly on the forks for proper balance. Do not lift a load with one fork.



Do not overload. Always handle loads within the rated capacity shown on the capacity plate.

Do not add extra counterweight to the truck.

An overload can cause the truck to roll over and cause injury to personnel and damage to the lift truck.



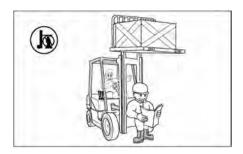
Do not drive on soft ground.

Observe all signs, especially those on maximum permitted floor loadings, elevator capacities and clearance heights.

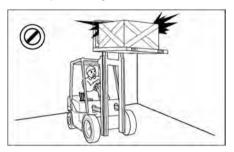
Handle loads carefully and check them closely for stability and balance.



Do not drive on slippery surfaces. Sand, gravel, ice or mud can cause a tipover. If unavoidable, slow down.



Do not permit anyone to stand or walk under the load or lifting mechanism. The load can fall and cause injury or death to anyone standing below.



Look out for overhead obstructions when raising or stacking loads. Do not travel with a raised load. Do not travel with the mast raised. The lift truck can roll over and cause injury or death to you or other personnel.



Do not move loose loads that are higher than the load backrest.

Be alert for falling loads when stacking.

Travel with the load tilted back and the forks as low as possible.

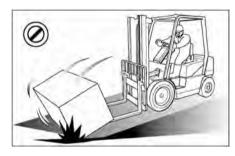
This will increase stability to the truck and load and permit better visibility for you.



Do not elevate the load with the mast tilted forward. Do not tilt the elevated loads forwards. This will cause the lift truck to tip over forward.

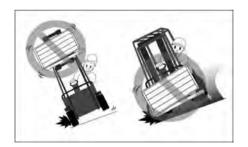


Do not jump off if your truck starts to tip over. Stay in your seat to survive.



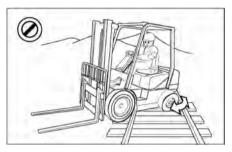
Go up ramps in forward direction and down ramps in reverse direction when moving loads.

Never elevate a load with the forklift truck on an incline. Go straight off and straight down. Use an assistant when going up or down a ramp with a bulky load.



Do not stack or turn on ramps.

Do not attempt to pick-up or deposit a load unless the lift truck is level. Do not turn on or drive across an incline.



Do not go over rough terrain. If unavoidable, slow down. Cross railroad tracks slowly and diagonally whenever possible. A railroad crossing can give a loaded forklift truck a real jolt. For smoother crossing, cross the railroad diagonally so one wheel crosses at a time.



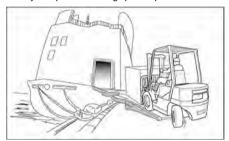
Avoid running over loose objects.

Look in the direction of travel. Look out for other persons or obstructions in your path of travel.

An operator must be in full control of his lift truck at all times.



Do not drive in forward direction when loads restrict your visibility. Operate your lift truck in reverse to improve visibility except when moving up a ramp.



Be careful when operating a lift truck near the edge of a loading dock or ramp. Maintain a safe distance from the edge of docks, ramps and platforms.

Always watch tail swing.

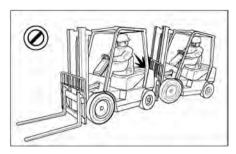
The truck can fall over the edge and cause injury or death.



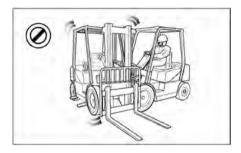
Do not operate on bridge plates unless they can support the weight of the truck and load.

Make sure that they are correctly positioned.

Put blocks on the vehicle you enter to keep it from moving.



Do not operate your truck close to another truck. Always keep a safe distance from other trucks and make sure there is enough distance to stop safely. Never overtake other vehicles.

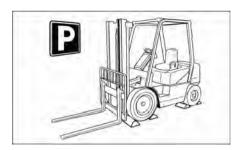


Do not use your lift truck to push or tow another truck. Do not let another push or tow your truck. If a truck will not move, call a service technician.



Forklift trucks may only be refueled at specially reserved locations. Switch off the engine when refueling. Smoking and handling of naked flames during refueling are strictly prohibited.

Mop up spilt fuel and do not forget to close the fuel tank before restarting the engine.



Park your lift truck in authorized areas only. Fully lower the forks to the floor, put direction lever in NEUTRAL position, engage the parking brake, and turn the key to the OFF position. Remove the key and put blocks behind the wheels to prevent the truck from rolling. Shut off your forklift truck when leaving it unattended.

Check the condition of your forklift truck after the day's work.

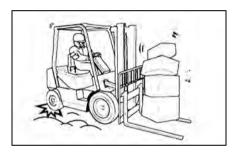


Exhaust from all internal combustion engines contains carbon monoxide, a colorless, odorless, tasteless, poisonous gas. Exposure to carbon monoxide can cause serious injury or health problems, including death, and avoid unnecessary idling of the engine. If nausea, dizziness or headaches are experienced stop the truck and seek fresh air.



Do not operate forklifts near flammable or combustible materials.

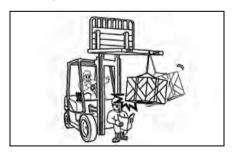
To avoid the discoloration, deformation or combustion of materials (such as lumber, veneer board, paper products and other similar items), always park at least 30 cm (12 inches) away from them.



Forklift trucks are not cars. They often have small tires, no suspension, and are very heavy.

The forklift's center of gravity will also change when carrying loads.

Avoid uneven bumps, pot holes and other hazards whenever possible.



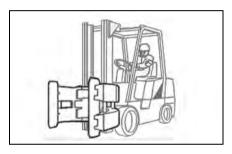
Carrying a load suspended on a chain or a cable may unbalance a truck.

Take extra care around pedestrians with a suspended load as it may sway or even strike them.



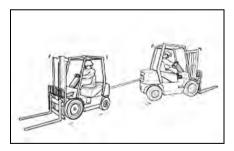
An unloaded forklift may be easier to tip over than a loaded truck.

When traveling without a load, the risk of lateral overturn is greater.



There are many special attachments available to replace the forks on a lift truck.

It is highly recommended that all the operators receive safety and special trainings.



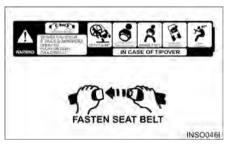
The counterweight draw bar should not be used for towing the forklift or for towing another forklift.

Towing is only advised in emergencies, by trained operators and at low speed, no faster than 2 km/h, to a convenient location for repair.

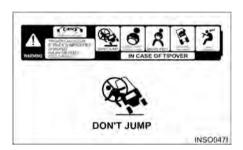
How to Survive in a Tipover (If Operator Restraint System Equipped)

▲ WARNING

In the event of a tipover, the risk of serious injury or death will be reduced if the operator is using the operator restraint system and follows the instructions provided.



Always use operator restraint system.



DON'T jump.



Hold on tight to the handle.



Spread your legs wide and secure the feet to the inner sides of the compartment.



Lean away from the direction of fall.



Lean forward.

Declaration of Conformity

We.

Manufacturer

Doosan Corporation Industrial Vehicle BG. 468, Injung-ro, Dong-gu, Incheon, Korea 22503

Authorized Representative and Compiler of Technical File According to 2006/42/EC Doosan Industrial Vehicle Europe N.V. Mr. Chankyo Chung Europark-Noord 36A, 9100 Sint-Niklaas, Belgium

herewith declare

that the following equipment conforms with the appropriate requirements of the Directives 2006/42/EC (Machinery Directive), 2000/14/EC as amended by 2005/88/EC (Noise Emission in the environment by equipment for use outdoors), 97/68/EC amended by 2012/46/EU and 2014/30/EU (EMC Directive) based on its design and type, as brought into circulation by us.

Description of the equipment:

Type : Lift Truck, Combustion-engine driven, Counterbalanced

Function : Lifting and Moving materials

Family : D40S-7 Series

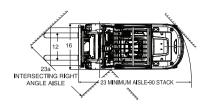
Model Name : D35S-7, D40S-7, D45S-7, D50C-7, D55C-7

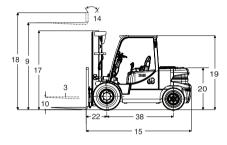
D40SC-7, D45SC-7, D50SC-7, D55SC-7

Specifications

CH	ARACTERISTICS			TIER-4 (G2, 55kW)		
2	Model			D35S-7	D40S-7	
3	Capacity	at rated load center	kg	3,500	4,000	
4	Load center	distance	mm	600	600	
5	Power type	electric, diesel, gasoline, LP-gas		Diesel	Diesel	
6	Operator type	Stand-on, Driver-seated		Driver-seated	Driver-seated	
7	Tire type	C=cushion, P=pneumatic		Р	Р	
8	Wheels(x=driven)	number, front/rear		x 2/2	x 2/2	
DIM	ENSIONS					
9	Lift with STD	maximum fork height	mm	3,000	3,000	
10	two-stage mast	free lift	mm	160	160	
12	Fork carriage	ISO class		III	III	
13	Forks	thickness x width x length	mm	50x150x1,050	50x150x1,050	
14	Tilt of mast	forward/backward	deg	8/10	8/10	
15		length without forks	mm	3,114	3,164	
16	Overall	width	mm	1,372	1,451	
17	dimensions	mast lowered height	mm	2,225	2,230	
18		mast extended height	mm	4,265	4,270	
19		to top overhead guard	mm	2,225	2,230	
21	Minimum outside turning ra	adius	mm	2,782	2,832	
22	Load moment constant		mm	561	561	
PEF	RFORMANCE	•				
24		travel, loaded/unloaded	km/h	27	27	
25	Speed	lift, loaded/unloaded	mm/s	560/600	550/600	
26		lowering, loaded/unloaded	mm/s	450/500	450/500	
28	Drawbar pull	at 1.6 km/h, loaded	kg	4,001	3,946	
30	Gradeability	at 1.6 km/h, loaded	%	42.2(23.0)	38.1(20.8)	
WE	IGHT					
32	Total weight	unloaded	kg	6,040	6,401	
33	Axle load	with loaded, front/rear	kg	8,340/1,200	9,106/1,295	
34		without loaded, front/rear	kg	2,702/3,338	2,669/3,732	
CH	CHASSIS					
35		number of front/rear		2/2	2/2	
36	Tires	size, front single		8.25x15-14	300x15-18	
		dual(option)		7.50x16-12	7.50x16-12	
37		size, rear		7.00x12-12	7.00x12-12	
38	Wheel base		mm	2,014	2,014	
39	Tread	front/rear	mm	1,138/1,115	1,153/1,115	
40	Ground clearance	loaded, at the lowest point	mm	160	160	
41		loaded, at center of wheelbase	mm	205	205	
42	Brake	service	\bot	disc	disc	
43		parking		ratchet	ratchet	
DRI						
45	Battery	voltage/ampere-hour	V/AH	12/75	12/75	
49	Engine	manufacturer/model		DI/D34NAP	DI/D34NAP	
		rated output (at rpm)		55/2,300	55/2,300	
50			kW/rpm	(74.8 ps)	(74.8 ps)	
51		max. torque	Nm/rpm	330/1,400	330/1,400	
52		cycle/cylinders/displacement	cc	4/4/3,409	4/4/3,409	
55	Transmission	type	\bot	powershift	powershift	
		No. speeds forward/reverse	\bot	2/2	2/2	
57	Operating pressure	system/attachment	bar	200/160	200/160	

TIER-4 (G2, 55kW)								
D45S-7 D50C-7 D55C-7 2								
4,500	5,000	5,500	3					
600	600	600	4					
Diesel	Diesel	Diesel	5					
Driver-seated	Driver-seated	Driver-seated	6					
	Р	Р	7					
x 2/2	x 2/2	x 2/2	8					
3,000	3,050	3,050	0					
160	170	170	10					
IV	IV	IV	12					
50x150x1,200	60x150x1,200	60x150x1,200	13					
8/10	8/10	8/10	14					
3,279	3,325	3,364	15					
1,451	1,451	1,451	16					
2,230	2,380	2,380	17					
4,420	4,470	4,470	18					
2,230	2,230	2,230	19					
2,877	2,925	2,975	21					
561	571	571	22					
001	071	0/1						
27	27	27	24					
540/600	530/600	520/600	25					
450/500	450/500	450/500	26					
3,970	4,000	4,035	28					
34.8(19.0)	·	27.5(15.0)	30					
34.6(19.0)	31.1(17.0)	27.5(15.0)	30					
6,883	7,324	7,725	32					
9,997/1,386			33					
	10,849/1,475	11,642/1,584	34					
2,893/3,990	3,068/4,256	3,236/4,489	34					
2/2	2/2	2/2	35					
300x15-18	300x15-18	300x15-18	36					
	7.50x16-12	7.50x16-12	30					
7.50x16-12			07					
7.00x12-12	7.00x12-14	7.00x12-14	37					
2,114	2,114	2,114	38					
1,153/1,115	1,153/1,115	1,153/1,115	39					
160	170	170	40					
205	205	205	41					
disc	disc	disc	42					
ratchet	ratchet	ratchet	43					
	1	1						
12/75	12/75	12/75	45					
DI/D34NAP	DI/D34NAP	DI/D34NAP	49					
55/2,300	55/2,300	55/2,300	50					
(74.8 ps)	(74.8 ps)	(74.8 ps)						
330/1,400	330/1,400	330/1,400	51					
4/4/3,409	4/4/3,409	4/4/3,409	52					
powershift	powershift	powershift	55					
2/2	2/2	2/2						
220/160	220/160	235/160	57					

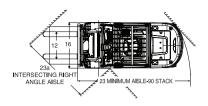


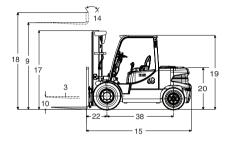


Specifications

СНА	RACTERISTICS			TIER-4 (C	32, 55kW)
2	Model			D40SC-7	D45SC-7
3	Capacity	at rated load center	kg	4,000	4,500
4	Load center	distance	mm	500	500
5	Power type	electric,diesel,gasoline,LP-gas		Diesel	Diesel
6	Operator type	Stand-on, Driver-seated		Driver-seated	Driver-seated
7	Tire type	C=cushion, P=pneumatic		Р	Р
8	Wheels(x=driven)	number, front/rear		x 2/2	x 2/2
DIME	ENSIONS				
9	Lift with STD	maximum fork height	mm	3,000	3,000
10	two-stage mast	free lift	mm	160	160
12	Fork carriage	ISO class		=	III
13	Forks	thickness x width x length	mm	50x150x1,050	50x150x1,050
14	Tilt of mast	forward/backward	deg	8/10	8/10
15		length without forks	mm	3,114	3,164
16	Overall	width	mm	1,372	1,451
17	dimensions	mast lowered height	mm	2,225	2,230
18		mast extended height	mm	4,265	4,270
19		to top overhead guard	mm	2,225	2,230
21	Minimum outside turning radiu	S	mm	2,782	2,832
22	Load moment constant		mm	561	561
PER	FORMANCE				
24		travel, loaded/unloaded	km/h	27	27
25	Speed	lift, loaded/unloaded	mm/s	560/600	550/600
26		lowering, loaded/unloaded	mm/s	450/500	450/500
28	Drawbar pull	at 1.6 km/h, loaded	kg	4,001	3,946
30	Gradeability	at 1.6 km/h, loaded	%	42.2(23.0)	38.1(20.8)
WEI	GHT				
32	Total weight	unloaded	kg	6,040	6,401
33	Axle load	with loaded, front/rear	kg	8,340/1,200	9,106/1,295
34		without loaded, front/rear	kg	2,702/3,338	2,669/3,732
CHA	SSIS				
35		number of front/rear		2/2	2/2
36	Tires	size, front single		8.25x15-14	300x15-18
		dual(option)		7.50x16-12	7.50x16-12
37		size, rear		7.00x12-12	7.00x12-12
38	Wheel base		mm	2,014	2,014
39	Tread	front/rear	mm	1,138/1,115	1,153/1,115
40	Ground clearance	loaded, at the lowest point	mm	160	160
41		loaded, at center of wheelbase	mm	205	205
42	Brake	service		disc	disc
43		parking		ratchet	ratchet
DRIVE					
45	Battery	voltage/ampere-hour	V/AH	12/75	12/75
49	Engine	manufacturer/model		DI/D34NAP	DI/D34NAP
		rated output (at ram)		55/2,300	55/2,300
50		rated output (at rpm)	kW/rpm	(74.8 ps)	(74.8 ps)
51		max. torque	Nm/rpm	330/1,400	330/1,400
52		cycle/cylinders/displacement	cc	4/4/3,409	4/4/3,409
55	Transmission	type		powershift	powershift
		No. speeds forward/reverse		2/2	2/2
57	Operating pressure	system/attachment	bar	200/160	200/160

TIER-4 (G2, 55kW)				
D50SC-7	D55SC-7	2		
5,000	5,500	3		
500	500	4		
Diesel	Diesel	5		
Driver-seated	Driver-seated	6		
P	P	7		
x 2/2	x 2/2	8		
3,000	3,050	9		
160	170	10		
IV	IV	12		
50x150x1,200	60x150x1200	13		
8/10	8/10	14		
3,279	3,314	15		
1,451	1,451	16		
2,230	2,380	17		
4,420	4,470	18		
2,230	2,230	19		
2,877	2,925	21		
561	571	22		
	0	1		
27	27	24		
540/600	530/600	25		
450/500	450/500	26		
3,970	4,000	28		
34.8(19.0)	31.1(17.0)	30		
0 1.0(10.0)	0()	- 00		
6,883	7,324	32		
9,997/1,386	10,409/1,415	33		
2,893/3,990	3,068/4,256	34		
_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0,000,0,000	1 -		
2/2	2/2	35		
300x15-18	300x15-18	36		
7.50x16-12	7.50x16-12			
7.00x12-12	7.00x12-14	37		
2,114	2,114	38		
1,153/1,115	1,153/1,115	39		
160	170	40		
205	205	41		
disc	disc	42		
ratchet	ratchet	43		
		1		
12/75	12/75	45		
DI/D34NAP	DI/D34NAP	49		
55/2,300	55/2,300			
(74.8 ps)	(74.8 ps)	50		
330/1,400	330/1,400	51		
4/4/3,409	4/4/3,409	52		
powershift	powershift	55		
2/2	2/2			
	220/160	_		

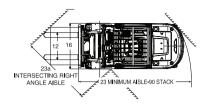


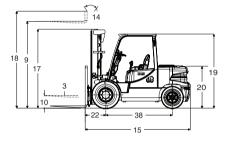


Specifications

CH	ARACTERISTICS				TIER-4 (G2, 74kW)
1	Manufacture			DOOSAN	DOOSAN	DOOSAN
2	Model			D35S-7	D40S-7	D45S-7
3	Capacity	at rated load center	kg	3,500	4,000	4,500
4	Load center	distance	mm	600	600	600
5	Power type	electric, Diesel, LPG		Diesel	Diesel	Diesel
6	Operator type	Stand-on, Driver-seated		Driver-seated	Driver-seated	Driver-seated
7	Tire type	C=cushion, P=pneumatic		pneumatic	pneumatic	pneumatic
8	Wheels(x=driven)	number, front/rear		2/2	2/2	2/2
	DIMENSIONS					
9	Lift with STD,	maximum fork height	mm	3,000	3,000	3,000
10	Fork, Carriage	free lift	mm	160	160	160
12		ISO class		CLASS III	CLASS III	CLASS IV
13	Forks	thickness x width x length	mm	50x150x1,050	50x150x1,050	50x150x1,200
14	Tilt of mast	forward/backward	deg	8/10	8/10	8/10
15		length without forks	mm	3,114	3,164	3,279
16		width	mm	1,372	1,451	1,451
17	Overall	mast lowered height	mm	2,225	2,230	2,230
18	Dimensions	mast extended height	mm	4,265	4,270	4,420
19		to top overhead guard	mm	2,225	2,230	2,230
20		seat height	mm	1,248	1,240	1,240
21	Minimum outside turning	g radius	mm	2,782	2,832	2,877
22	Load moment constant		mm	561	561	561
<u> </u>	PERFORMANCE	T				
24		travel, unloaded	km/h	27	27	27
25	Speed	lift, loaded/unloaded	mm/s	580/630	570/630	560/630
26	D	lowering, loaded/unloaded	mm/s	450/500	450/500	450/500
28 30	Drawbar pull	at 1.6 km/h, loaded	kg %	4,003	3,941	3,972
30	Gradeability WEIGHT	at 1.6 km/h, loaded	%	42.0(22.9)	37.8(20.6)	34.7(18.9)
32	Total weight	unloaded(option)	kg	6,110	6.400	6.844
33	rotal weight	with loaded(front/rear)		8.402/1.208	9.093/1.307	9.976/1.368
34	Axle load	without loaded(front/rear)	kg kg	2,738/3,377	2.622/3.778	2,838/4,006
CHASSIS		without loaded(ifolit/fear)	kg	2,730/3,377	2,022/3,770	2,030/4,000
35	CHASSIS	number of front/rear	1	2/2	2/2	2/2
33		size, front single		8.25x15-14	300x15-18	300x15-18
36	Tires	size, front single(option)		7.50x16-12	7.50x16-12	7.50x16-12
37		size, rear	-	7.00x10-12	7.00x10-12 7.00x12-12	7.00x12-12
38	Wheel base	5120, 1001	mm	2,014	2,014	2,114
39	Tread	front/rear	mm	1,138/1,115	1,153/1,115	1,153/1,115
40		loaded, at the lowest point	mm	160	160	160
41	Ground clearance	loaded, at center of wheelbase	mm	205	205	205
42	Service Brake	1 2 100 10 10 10 10 10 10 10 10 10 10 10 10		disc	disc	disc
43	Parking Brake			ratchet	ratchet	ratchet
	DRIVE			1	1	1
45	Battery	voltage/ampere-hour	V/AH	12/100	12/100	12/100
49	•	manufacturer/model		DI/D34P	DI/D34P	DI/D34P
		rated output	ps/rpm	100/2,300	100/2,300	100/2,300
50	Fasias	(DIN)	(kw)	(73.6)	(73.6)	(73.6)
51	Engine	max. torque	Nm/rpm	335/1,600	335/1,600	335/1,600
52		cycle/cylinders/displacement	cc	4/4/3,409	4/4/3,409	4/4/3,409
53		Fuel tank capacity	ł	118ℓ	118ℓ	131ℓ
55		type		POWER	POWER	POWER
	Transmission	**		SHIFT	SHIFT	SHIFT
56		No. speeds (forward/reverse)		2/2	2/2	2/2
57	Operating pressure	system/attachment	bar	200/160	200/160	220/160

TIER-4 (G2, 74kW)				
DOOSAN	1			
D50C-7	DOOSAN D55C-7	2		
5,000	5,500	3		
600	600	4		
Diesel	Diesel	5		
Driver-seated	Driver-seated	6		
pneumatic	pneumatic	7		
2/2	2/2	8		
2/2	2/2	0		
3,050	3,050	9		
170	170	10		
CLASS IV	CLASS IV	12		
60x150x1,200	60x150x1,200	13		
8/10	8/10	14		
3,325	3,350	15		
1,451	1,451	16		
2,380	2,380	17		
4,470	4,470	18		
2,230	2,230	19		
1,240	1,240	20		
2,925	2,975	21		
571	571	22		
0, 1	0.1			
27	27	24		
550/630	540/630	25		
450/500	450/500	26		
4,006	4,035	28		
31.7(17.3)	29.3(16.0)	30		
0111(1110)	20.0(10.0)	- 00		
7,394	7,794	32		
10,911/1,483	11,703/1,591	33		
3,097/4,297	3,264/4,530	34		
0,0017 1,201	0,201/1,000	0.		
2/2	2/2	35		
300x15-18	300x15-18			
7.50x16-12	7.50x16-12	36		
7.00x12-14	7.00x12-14	37		
2,114	2,114	38		
1,153/1,115	1,153/1,115	39		
170	170	40		
205	205	41		
disc	disc	42		
ratchet	ratchet	43		
12/100	12/100	45		
DI/D34P	DI/D34P	49		
100/2,300	100/2,300			
(73.6)	(73.6)	50		
335/1,600	335/1,600	51		
4/4/3,409	4/4/3,409	52		
131ℓ	131ℓ	53		
POWER	POWER			
SHIFT	SHIFT	55		
2/2	2/2	56		
220/160	235/160	57		

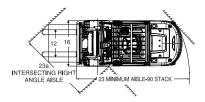


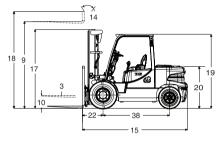


Specifications

CH	ARACTERISTICS			TIER-4 (G	· ·
1	Manufacture			DOOSAN	DOOSAN
2	Model			D40SC-7	D45SC-7
3	Capacity	at rated load center	kg	4,000	4,500
4	Load center	distance	mm	500	500
5	Power type	electric, Diesel, LPG		Diesel	Diesel
6	Operator type	Stand-on, Driver-seated		Driver-seated	Driver-seated
7	Tire type	C=cushion, P=pneumatic		pneumatic	pneumatic
8	Wheels(x=driven)	number, front/rear		2/2	2/2
	DIMENSIONS				
9	Lift with STD,	maximum fork height	mm	3,000	3,000
10	Fork, Carriage	free lift	mm	160	160
12		ISO class		CLASS Ⅲ	CLASS Ⅲ
13	Forks	thickness x width x length	mm	50x150x1,050	50x150x1,050
14	Tilt of mast	forward/backward	deg	8/10	8/10
15		length without forks	mm	3100	3151
16		width	mm	1372	1451
17	Overall	mast lowered height	mm	2225	2230
18	Dimensions	mast extended height	mm	4265	4270
19		to top overhead guard	mm	2225	2230
20		seat height	mm	1248	1240
21	Minimum outside turnin	g radius	mm	2782	2832
22	Load moment constant		mm	561	561
	PERFORMANCE				
24		travel, unloaded	km/h	27	27
25	Speed	lift, loaded/unloaded	mm/s	580/630	570/630
26		lowering, loaded/unloaded	mm/s	450/500	450/500
28	Drawbar pull	at 1.6 km/h, loaded	kg	4,003	3,941
30	Gradeability	at 1.6 km/h, loaded	%	42.0(22.9)	37.8(20.6)
	WEIGHT				
32	Total weight	unloaded(option)	kg	6,110	6,400
33	Axle load	with loaded(front/rear)	kg	8,402/1,208	9,093/1,307
34	Axie ioau	without loaded(front/rear)	kg	2,738/3,377	2,622/3,778
	CHASSIS				
35		number of front/rear		2/2	2/2
36	Tires	size, front single		8.25x15-14	300x15-18
30	Tires	size, front single(option)		7.50x16-12	7.50x16-12
37		size, rear		7.00x12-12	7.00x12-12
38	Wheel base		mm	2,014	2,014
39	Tread	front/rear	mm	1,138/1,115	1,153/1,115
40	Ground clearance	loaded, at the lowest point	mm	160	160
41	Ground clearance	loaded, at center of wheelbase	mm	205	205
42	Service Brake			disc	disc
43	Parking Brake			ratchet	ratchet
	DRIVE			•	
45	Battery	voltage/ampere-hour	V/AH	12/100	12/100
49		manufacturer/model		DI/D34P	DI/D34P
E0.		rated output	ps/rpm	100/2,300	100/2,300
50	Engino	(DIN)	(kw)	(73.6)	(73.6)
51	Engine	max. torque	Nm/rpm	335/1,600	335/1,600
52		cycle/cylinders/displacement	cc	4/4/3,409	4/4/3,409
53		Fuel tank capacity	l	118ℓ	118ℓ
55	+	type		POWER SHIFT	POWER SHIFT
56	Transmission	No. speeds (forward/reverse)		2/2	2/2

TIED 4 (C2 74L)A0				
TIER-4 (G2, 74kW) DOOSAN DOOSAN 1				
D50SC-7	D55SC-7	2		
5,000	5,500	3		
500	5,500	4		
		5		
Diesel Driver-seated	Diesel Driver-seated	6		
		7		
pneumatic 2/2	pneumatic 2/2	8		
2/2	2/2	0		
3,000	3,050	9		
160	170	10		
CLASS IV	CLASS IV	12		
50x150x1,200	60x150x1,200	13		
8/10	8/10	14		
3265	3300	15		
1451	1451	16		
2230	2380	17		
4420	4470	18		
2230	2230	19		
1240	1240	20		
2877	2925	21		
561	571	22		
301	571	22		
27	27	24		
560/630	550/630	25		
450/500	450/500			
3,972	4,006	26 28		
34.7(18.9)	31.7(17.3)	30		
34.7 (10.9)	31.7(17.3)	30		
6,844	7,394	32		
9,976/1,368	10,911/1,483	33		
2,838/4,006	3,097/4,297	34		
2,030/4,000	3,03174,231	34		
2/2	2/2	35		
300x15-18	300x15-18	- 00		
7.50x16-12	7.50x16-12	36		
7.00x10-12 7.00x12-12	7.00x10-12	37		
2,114	2,114	38		
1,153/1,115	1,153/1,115	39		
160	170	40		
205	205	41		
disc	disc	42		
ratchet	ratchet	43		
TOTOTICE	TOTOTION	70		
12/100	12/100	45		
DI/D34P	DI/D34P	49		
100/2,300	100/2,300			
(73.6)	(73.6)	50		
335/1,600	335/1,600	51		
4/4/3,409	4/4/3,409	52		
1318	131ℓ	53		
POWER	POWER			
SHIFT	SHIFT	55		
2/2	2/2	56		
220/160	220/160	57		
		•		





Noise and Vibration

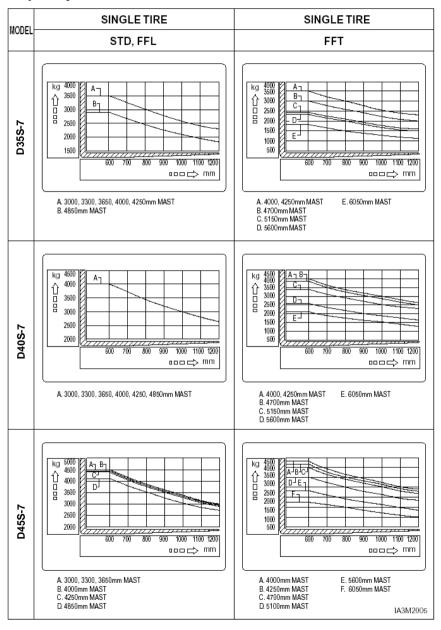
Noise

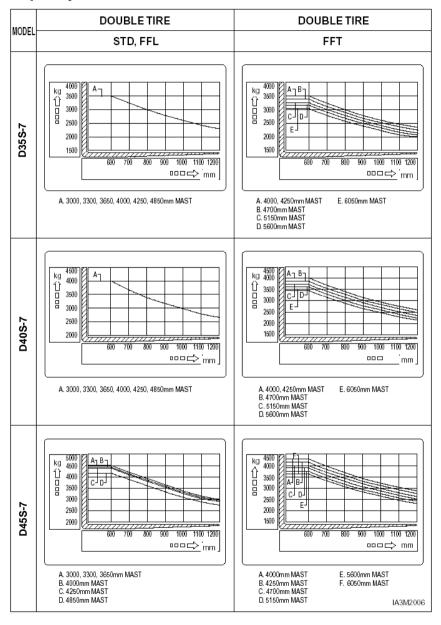
	Noise Level [Unit : dB(A)]		
Model	Sound Pressure Level at Operator's ear (Leq.)		
	prEN12053		
D35/40/45S-7, D50/55C-7, D40/45/50/55SC-7 (Cabin) (TIER-4)	86.5		

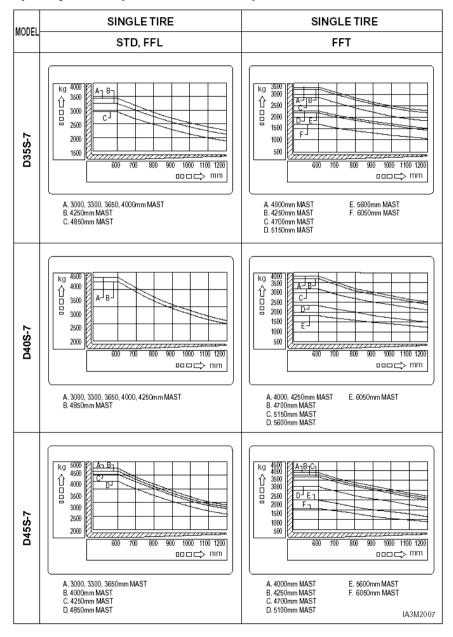
Vibration (weighted overall value)

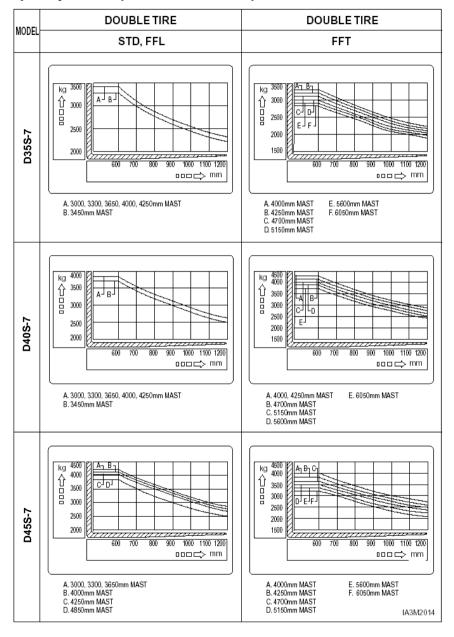
Unit: m/sec2

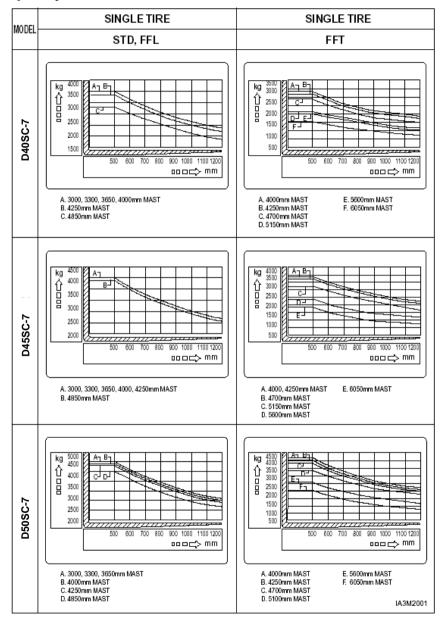
Model	Measuring place			
Model	Seat	Steering Wheel	Floor Plate	
D35/40/45S-7, D50/55C-7, D40/45/50/55SC-7 (D34NAP/D34P) (TIER-4)	0.38	0.68	0.05	

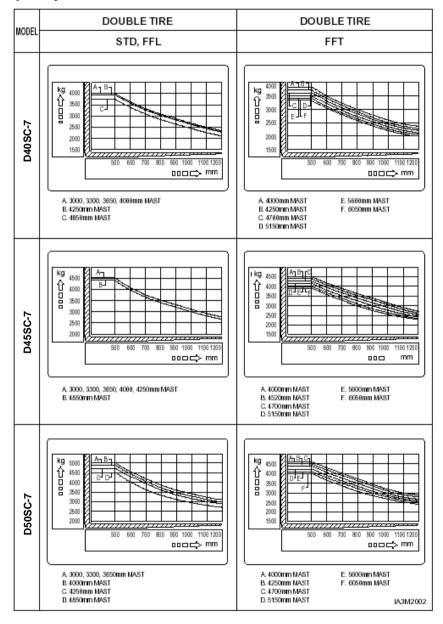


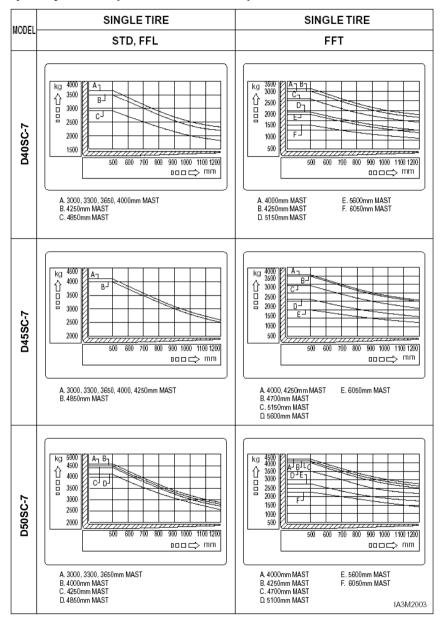


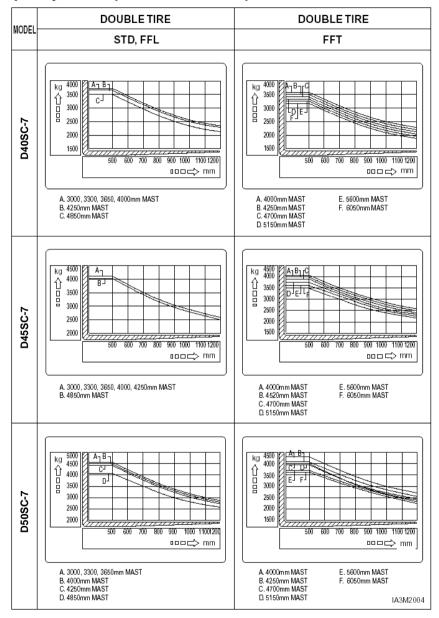


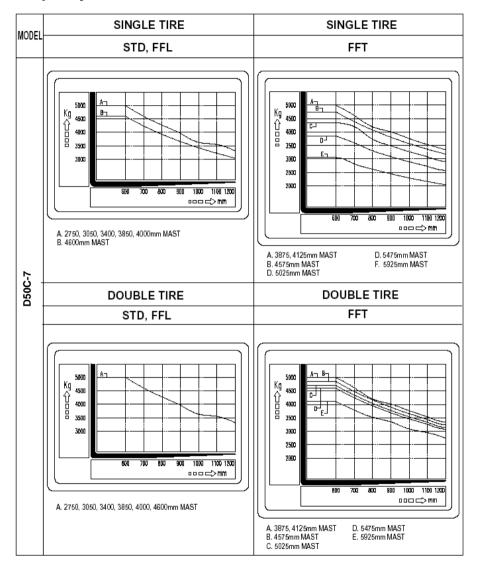


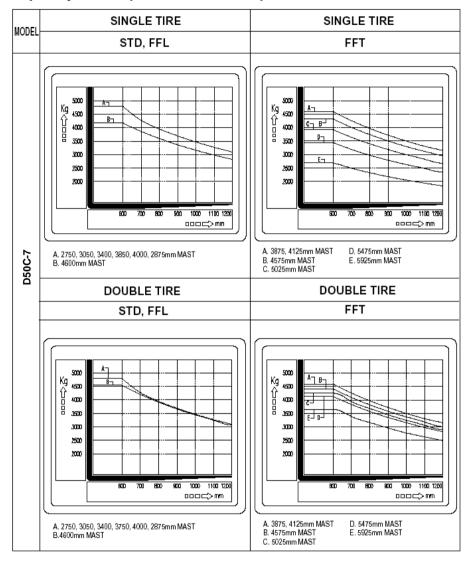


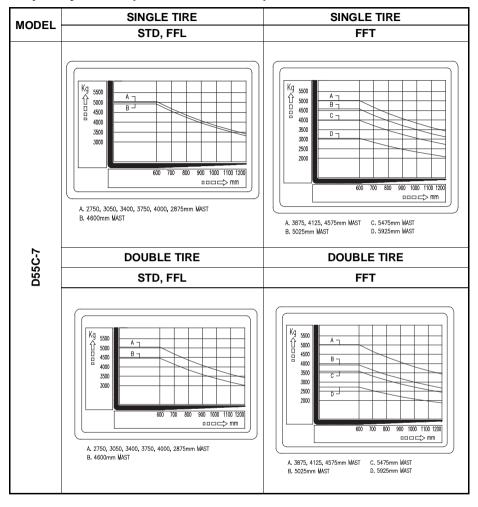


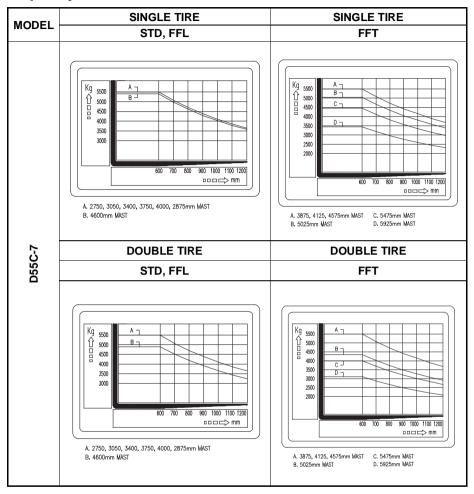


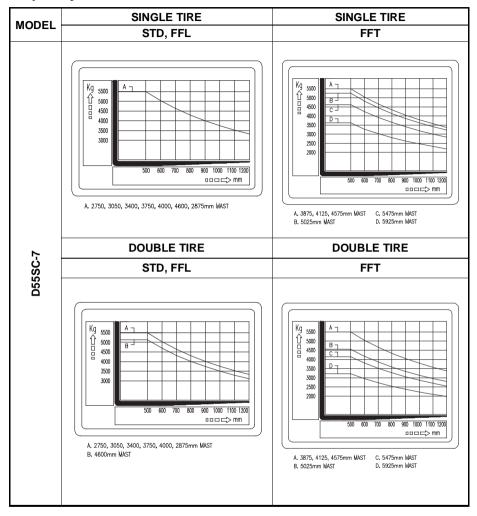


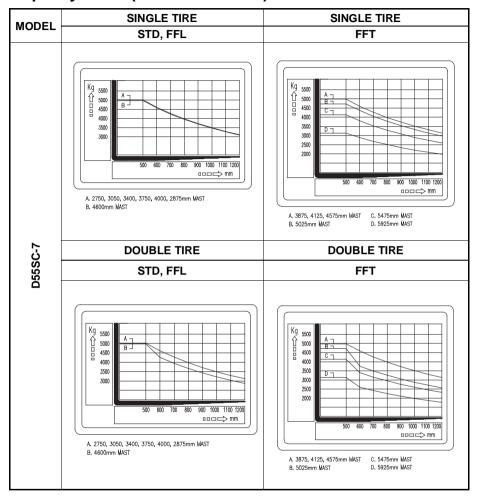












Serial Number

Serial Number Locations

For quick reference, record your lift truck's serial numbers in the spaces provided below the photographs.



Lift Truck Serial Number



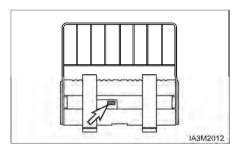
Engine Serial Number



Transmission Serial Number



DRIVE AXLE Serial Number



Side Shifter Serial Number (If Equipped)

Operator's Warning and Identification Plate

Familiarize yourself with the OPERATOR'S WARNING Plate, and IDENTIFICATION, LIFT CAPACITY and ATTACHMENT PLATES. Do not exceed capacity as equipped load ratings.

Operator's Warning Plate



Located on the cowl to the right side of the steering column.

Identification, Lift Capacity and Attachment Plate



Located on the front side of the FCU.

Lift Truck Capacity Rating

Do not exceed allowable lift truck working capacity load ratings.

The capacity of the lift truck is given by weight and distance to the load center. For example, a capacity of 1200kg (2640lb) at 600mm (24in) means that the lift truck can lift 1200kg (2640lb) if the load center is 600 mm (24in) from both the vertical and horizontal faces of the forks.

Before attempting to lift any load, ensure that the weight and load center combination is within the capacity of the lift truck as shown on the capacity rating plate. To determine the load center, measure the distance from the face of the carriage to the gravitational center of the load

The rated capacity on the plate refers to the capacity of the lift truck as it left the factory. Subsequent changes of any form to the equipment or battery can alter the lift truck's rating.

The rated capacity of the lift truck applies to operating conditions where the lift truck is on level ground. The capacity of the lift truck is reduced on inclines.

Below are abbreviations that may appear on the Identification, Lift Capacity and Attachment Plate and their meanings.

Mast Abbreviations

STD - Standard Mast (single inner member, low free lift)

FF - Full Free Lift Mast (single inner member with high free lift duplex cylinder)

FFT - Triple Lift Mast (two inner members) with either low or full free lift characteristics.

QUAD - Quadruple (Quad) Mast (with three inner members)

NOTE: When only a mast-type is listed on the identification plate, a standard carriage and forks are used.

Attachment Abbreviations (Includes Special Forks)

SC - Special Carriage-increased width, height or outreach

SSS - Shaft-type Sideshift Carriage

HSS - Hook-type Sideshift Carriage (ITA)

CW - Counterweight

SF - Special Forks

SWS - Swing Shift, Sideshift

RAM - Ram or Boom

DBCBH - Double Cube Block Handler

HFP - Hydraulic Fork Positioner

CR - Crane Arm or Crane Boom

TH - Tire Handler

CTH - Container Handler

LPP - Load Push-Pull Device

CC - Carton Clamp

RC - Roll Clamp

LS - Load Stabilizer

PWH - Pulp Wood Handler

SS-ST - Sideshift-Side Tilt Carriage

Operator's Station and Monitoring Systems

Instrument Panel

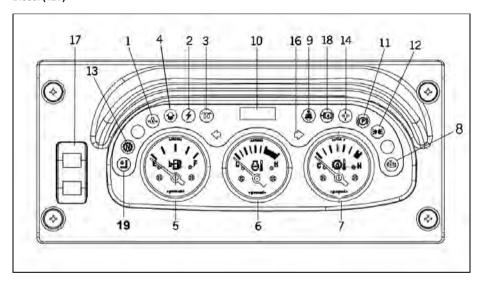
Your lift truck may not have the same indicator or warning lights as shown in the illustrations.

Due to the various options available, typical instrument panels are shown.

However, the symbols on the indicators and lights on your panel identify what those particular items are.

Also, the symbol for each of the items is identified and an explanation of their function and location is described on the following pages.

Diesel (12V)





1. Engine Oil Pressure Indicator Light -Indicates insufficient engine oil pressure. The light will come on when the ignition switch is

turned to the ON position. The light should go off after the engine is started. If the light turns on while operating the lift trucks, insufficient engine oil pressure is indicated. Park the lift truck and stop the engine.



2. Alternator Indicator Light - Indicates if the battery charging system is operational. The light will come on when the ignition switch is turned to the ON position.

The light should go off after the engine is started, indicating the alternator is producing sufficient voltage to charge the battery. If the light turns on with the engine running, check the alternator charging system for a malfunction.



3. Diesel Engine Start Preheat Indicator Light - The light will come ON when the key is turned to the ON position from the OFF position. This indicates that the glow plugs are preheating the pre-combustion chambers for easier starting.

The amount of time needed to preheat the precombustion chambers is approximately seven seconds. depending on the surrounding air temperature. When the light goes OFF the maximum pre-combustion chamber temperature has been reached and the key can be turned to the START position to start the engine.



4. Diesel Engine Water in Fuel Filter Indicator Light (If Equipped) - Indicates when the engine is running, there is water in the fuel filter exceeds 100cc.

The light will come ON when the ignition switch is turned to the ON position. The light should go off after the engine is started. If the light turns on with the engine running, park the lift truck and stop the engine.

Drain some fuel (and any water) until clean fuel flows from the filter which approximately takes 5 to 6 seconds.



5. Fuel Level Gauge - Shows current level of the fuel in the fuel tank. Replenish fuel when the Level Gauge indicates "E" during the forklift operation.



6. Engine Coolant Temperature Gauge - Shows current temperature of the engine coolant. If the gauge pointer moves beyond the red band during the operation, the engine is overheated. Park the lift truck and stop the engine.

Check the cooling system for any defect. The pointer will be in the red band when the coolant temperature reaches approximately 110 °C on all engines.



7. Transmission Oil Temperature Gauge - Shows transmission oil temperature if the gauge pointer moves beyond the red band during operation, the engine is overheated. Park the lift truck and stop the engine.

Check the system for any defect. The pointer will be in the red band when the transmission oil temperature reaches approximately 125 °C.



8. Engine Malfunction Indicator Lamp (MIL) - Engine control system are equipped with built-in fault diagnostics. Detected system

faults can be displayed by the Malfunction Indicator Lamp (MIL) as Diagnostic Faults Codes (DFC) or flash codes, and viewed in detail with the use of service tool software. When the ignition key is turned ON the MIL will perform a self-test, illuminate once and then go OFF. If a detected fault condition exists, the fault or faults will be stored in the memory of the engine control module (ECM). Once a fault occurs the MIL will illuminate and remain ON. This signals the operator that a faults has been detected by the SECM.



9. Seat Belt Warning Light (If Equipment) -Indicates when the seat belt does not fastened by operator.

The light will come on when the ignition switch is turned to the on position. The light should go off after engine is started.



10. Service Hour Meter - Indicates the total number of hours the engine and the lift truck have operated. The hour meter will operate when the ignition switch is in the ON position, whether the engine is running or not. The hour meter is used to determine lubrication and maintenance intervals.



11. Parking indicator light- The light will come ON when the parking lever is applied.



12. Front Floodlights- Push down the switch (17), to the first step, to turn the front floodlights on.

Front and Rear Floodlights - Push down the switch (17), to the second step, to turn both the front and rear floodlights on. The floodlights are optional.



13. Transmission Neutral Position Light -Indicates the neutral position of transmission.



14. Drive Axle Oil Indicator Light (OCDB) only) - Indicates too hot drive axle oil. The light will be ON when the ignition switch is in the ON position and must go OFF when the

engine is running.

Do not continue to operate the lift truck if the light is ON during operation.



15. Directional Turning Indicator Light



16. Front and Rear Floodlights Switch – The front flood right is ON when you push down the switch to the first step.

The front and rear floodlights are ON when you push down the switch to the second step.

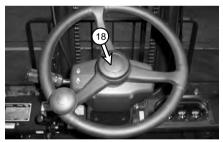


17. Brake Fluid Oil & Drive Axle Oil Light — The light is ON when the brake fluid oil of brake reservoir comes down to low level position. Refill the proper brake fluid oil if its light is ON.

The light is BLINK when the temperature of Drive Axle Oil was over heated. Do not continue to operate the lift truck if the light is BLINK during operation.

▲ WARNING

Frequent rapid starts at 2nd speed can be the cause of overheating at torque converter. With this operating condition, the pointer can sometimes exceed the green band. If this situation occurs from time to time, please avoid this operating condition to protect the transmission and increase the work efficiency. That is, start the truck at 1st speed and shift to 2nd speed to increase the travel speed.





18. Horn Switch - Push on the horn button to sound the horn.



19. Mast interlock – Alarm warning lights when operator leaves the seat without applying parking brake and then, operation of mast is automatically interrupted.

Engine Compartment



 The engine compartment is accessible by pulling the latch and raising the hood and seat assembly.

NOTE: Unlock the latch before pulling it if you have its key.



The hood and seat assembly is held up by a support cylinder. Make certain the air cylinder is operating properly and securely holds the hood up before doing anything in the engine compartment.

Circuit Breaker



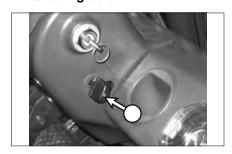
Typical Example

Diesel Engine Truck



Circuit Breaker - Protects the main electrical circuits. To reset the circuit breaker, push the button in. It is located in the engine compartment.

Tilt Steering Column



To adjust the steering column, push down the knob(1), and move the steering column to the desired position, then release the knob(1).

Electrical Disconnect Switch (If E quipped)





1. ON-Connects the battery for electrical power to all electrical circuits.



2. OFF-Disconnects the battery from all electrical circuits.

Seat

NOTE: Seat arrangements may vary. Basic operation will be similar.

Seat adjustment should be checked at the beginning of each shift and when operators change.

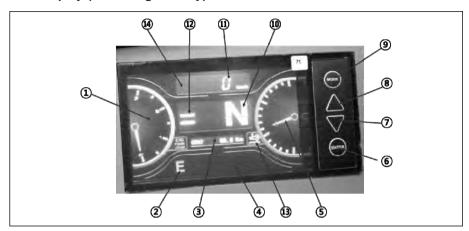
Lock the seat into position before operating, to prevent an unexpected seat change.

Adjust seat to allow full brake pedal travel with operator's back against seat back.



NOTE: The seat can be correctly adjusted only when the operator is fully seated.

SCR Display (74kW Engine Only)



- 1. Tachometer (RPM GAUGE)
- Display engine RPM with 1/1000 unit.

2. MULTI TORQUE MODE for engine

- Display mode of multi torque, for setting mode, refer page 67
- "S" means "standard mode" with registered in specification sheet. "E" means "economic mode" and this mode shall restrict max rpm 2320 and derate max torque and power. "D" means "driving mode" and this mode shall restrict max rpm 2520 and derate max torque and power. Refer to service manual for the derated max torque level and power of "E" and "D" mode.

3. ODOMETER

- Accumulated total mileage.

4. WARNING LAMP

- Warning Lamp for Transmission and engine etc.

5. DEF/Ad-Blue LEVEL GUAGE

 Display DEF/Ad-Blue Level, residual quantity of DEF/Ad-Blue in DEF/Ad-Blue Tank (DEF /Ad-Blue: Fluid for SCR System)

6. ENTER (SELECT)

- Key for operating LCD Display.

7. DOWN (RIGHT)

- Key for operating LCD Display.

8. UP (LEFT)

- Key for operating LCD Display.

9. MODE (BACK)

- Key for operating LCD Display by pressing button.

10-1. DIRECTION (T/M STATUS, 3Speed T/M only)

- Display Status for direction. "N" or "F" or "R"

10-2. SPEEDOMETER (4ton only)

- Display the current vehicle speed.

11-1. SPEEDOMETER (7ton only)

- Display the current vehicle speed.

11-2. CLOCK (4ton only)

- Display the current time.

12. GEAR DISPLAY (AUTO / MANUAL, 3Speed T/M only) - The gear range indicator bars will indicate which gear is selected by displaying the corresponding number of bars. The forward and reverse indicator bars will be "OFF" when the transmission is in "MANUAL MODE". When transmission is in "AUTOMATIC MODE", all the gear range indicator bars and both travel direction indicators will be "ON".

13. DEF/Ad-Blue Level Indicator

- Indicator lamps for DEF/Ad-Blue Level

a. For USA

. Over 10%: Green ON

. 5~10%: Yellow ON

. 2.5~5%: Red ON

. Below 2.5%: Red Blink

b. For Europe

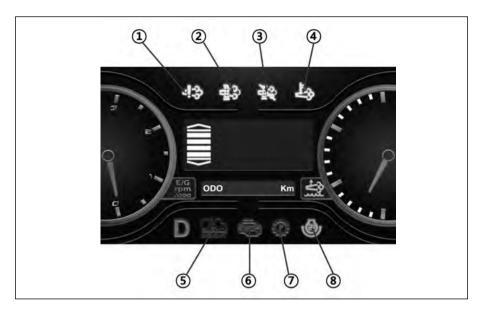
. Over 10%: Green ON

. 5~10%: Yellow ON

. Below 5%: Red Blink

14. Speed limit Symbol

- If speed limit option selected, the symbol is on.



1. DEF/Ad-Blue FAULT WARNING

- If the lamp is turned on, after-treatment system should be checked.
- Refer page. 81 (Section "Detecting control failure)

2. SCR Cleaning-DeSOx Request / On

- In order that the SCR system may maintain its exhaust cleaning efficiency at a proper level, it should be periodically initialized - "SCR cleaning."
 - Once the indicator lamp lights up, you should conduct the SCR cleaning process. During this process you can't use the vehicle.
- Pop-up window and the lamp will be turned on 10 hours before if "Service SCR Cleaning-DeSOx" needed.
- "Service SCR Cleaning-DeSOx" will take about 30 minutes; the lamp will blink during the process.
- Press the "SCR Cleaning-DeSOx" switch continuously for 3 sec, SCR cleaning will be started. For detailed instructions refer to p.68.

3. SCR Cleaning-DeSOx Inhibition

 When the symbol is turned on and "Active SCR Cleaning-DeSOx" is inhibited by pressing the inhibition switch. In places where there is a risk of fire or explosion, to prevent fire or explosion caused by flammable substances or particles inhibition switch should be used

- 4. High Exhaust System Temperature (HEST)
 - While SCR Cleaning-DeSOx for after-treatment, the temperature of exhaust gas will increase over 600℃. If this lamp on, operator should warn passengers around the truck not to approach or touch exhaust system especially rear side. And if the place of your truck has flammable material (Gas, Particle etc.) please replace truck to other safety zone.

5. Weight Scale Mode

 Press "MODE" once, Display will change to weight scale mode, for detailed instructions, refer to page 64.

6. Engine Check Lamp (RED)

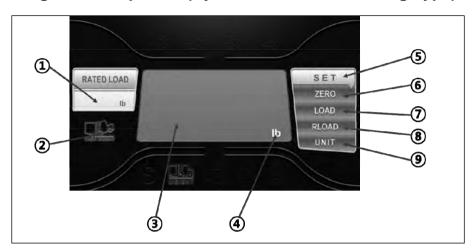
- Malfunction or necessary for diagnostic of engine, this lamp will light on.
- To check error, press "MODE" 3 seconds, display will converse to main menu then you can use check function. For detailed instructions refer to p.81.

7. Transmission Check Lamp (RED)

- Malfunction or necessary for diagnostic of transmission, this lamp will light on.
- To check error, press "MODE" 3 seconds, display will converse to main menu then you can use check function. For detailed instructions refer to p.59.

8. Fan Reverse (For D100 Model)

Weight Scale Optional (Hydraulic Pressure Sensing Type)



If weight scale option(Hydraulic Pressure Sensing Type) equipped, operator can measure and limit load with display. Press "MODE" to convert display from normal to weight scale.

a) Initial setting

To use weight Scale option, need initial setting. i) Unload (Zero) mode, ii) Load mode, iii) Rated load mode.

i) Unload (Zero) Setting

Press "MODE" 2 sec, 'SET (\odot)' and 'ZERO (\odot)' light will on. Weight digit will blink with " - - - - ". Then Press \triangle , ∇ button and set "0". Finish with 'Enter'

button 1 sec. ('SET(®)' and 'ZERO(®)' lamp will blink 3 second and off)

ii) Unload Setting

Press "MODE" 2 sec, 'SET(®)' and 'ZERO(®)' light will on. Press "MODE" one more time. 'SET(®) and 'LOAD(®)' light will on. Weight digit will blink with

" - - - - ". Then Press \triangle , ∇ button and set weight of the load. Finish with 'Enter' button 1 sec . ('SET(\otimes)' and 'LOAD(\otimes)' lamp will blink 3 second and off)

iii) Rated Load Setting

Press "MODE" 2 sec, 'SET(®)' and 'ZERO(®)' light will on. Press "MODE" twice.

'SET(⑤) and 'RLOAD(⑥)' light will on. Weight digit will blink with "----". Then press △, ▽ button and set weight of the load. Finish with 'Enter' button 1 sec. ('SET(⑥)' and 'RLOAD(⑥)' lamp will blink 3 second and off)

b) Unit change

Press "MODE" 2 sec, 'SET(\$\sigma\$)' and 'ZERO(\$\sigma\$)' light will on. Press "MODE".

'SET(\odot) and 'RLOAD(\odot)' light will on. Load unit(\odot) will blink. User can change unit by using \triangle , ∇ button. Finish with 'Enter' button 1 sec.

 c) If operator try to lift weight over rated load, warning lamp(@) will be on.

Weight Scale Option (Load Cell Type)

With this weight scale option, the operator can measure and limit the load's weight using a display panel. Using the key () vou can start settings.



1. Entering the Calibration Mode

To perform initial settings for the load cell, enter the calibration mode as follows:



Press this key when "ST.CAL" is displayed to start calibration mode.



Press this key once again.



2. Specifying a Minimum Scale

You can select a minimum scale on which the load cell displays the weight from among 1 kg, 2 kg, 5 kg, 10 kg, 20 kg, and 50 kg (for example, 1235 kg is displayed with a 5 kg minimum scale and 1250 kg displayed with a 50 kg scale). The default value is "10 kg."



Each time you press this key, the setting increases in the order of 01, 02, 05, 10, 20, and 50.



Press this key to save the minimum scale setting and proceed the subsequent step.



Press this key to move to the previous step.



3. Specifying a Maximum Measuring Scale

This step is to specify the rated capacity of the vehicle on which the load cell is installed.

Since the device does not weigh a load heavier than the set capacity (determins to be overloaded), it is recommended to set the capacity to be 5% higher than the actual value taking into consideration the safety factor.



Each time you press this key, the number (0 to 9) at the cursor position increases by



Each time you press this key, the cursor is moved to the left by one point.



Press this key to save the set value and proceed the subsequent step.



Press this key to move to the previous step.



4. Zero Adjustment

This step is to set the weight condition of the vehicle's unloaded front end to zero. Keeping the mast unloaded, raise it approx. 300 mm from the ground just vertically.



Press this key to save the set value and proceed the subsequent step.



Press this key to move to the previous step.



5. Inputting a Reference Load

This step is to input the weight of a reference load needed for weight setting.

If the weight of the reference load is 3,000 kg, input "3000" and proceed the next step (reference load lift).

The initial setting value should be set to 50% to 60% of the rated capacity (for a 7 ton capacity model for example, use a 3.5 to 4 ton load).



Each time you press this key, the number (0 to 9) at the cursor position increases by 1



Each time you press this key, the cursor is moved to the left by one point.



Press this key to save the set value and proceed the subsequent step.



Press this key to move to the previous step.



6. Reference Load Lift

Put a reference load that weighs as much as the set value on the attachment (e.g. forks). You should align the centers of gravity of the

attachment and of the reference load.
Raise the mast approx. 300 mm from the ground vertically.

Once the vehicle's vibration ends after lifting the load, press the Enter key.



Press this key.



7. Finishing Calibration

Once you have done all the steps above, a certain figure appears along with a blinking message "C._End" on the display for a while, and then the weight scale mode resumes."

Initial settings for the load cell has been finished. Use this device after fully lowering the load for the indicator to display 0 kg.



Audio System (AM/FM Tuner with USB/AUX Player)

Location of controls



1. AM button: Select AM Radio mode.

2. FM button: Select FM Radio mode.

3. USB button: Select USB player.

4. AUX button: Select AUX mode.

- POWER/MUTE [域] button with VOLUME dial: Turn the power on or mute function on/off (press); turn the power off (press and hold); control the volume level (rotate).
- Display window for Play/Reception/Menu state and information.
- 7. PRESET [1 ||] [6 D+] buttons

Radio mode: Recall each stored station(press); store each station (press and hold)

USB mode: Change the playback mode ([1 \parallel]/[2 RPT]/[3 RDM] buttons); shows available information about the current track ([4INFO] button); move to folder down/up ([5 D-]/[6 D+] buttons).

8. SCN/AST button with | ◀ ◀ TUNE/TRACK
▶ ▶ | dial

Radio mode: Plays frequencies with superior reception for 5 seconds each (press); Saves frequencies with superior reception to Preset buttons (press and hold). select the reception frequency manually (rotate).

USB mode: Scans the beginning parts (approx. 10 seconds per track) of tracks (press); moves to the previous/next track (rotate); rewind or fast-forward the track (rotate and hold).

- 9. LOUD button: Turn the Loudness mode on/off.
- 10.MENU button: Enter the sound setting mode (press); show/hide the clock or when power is off, enter the clock setting mode (press and hold).
- 11.Input Terminal cover: Open the cover to connect the external audio device or the USB device.
 - AUX IN jack: Connect the external audio device.
 - USB port: Connect the USB device.

Display window



- **1. USB/AUX** indicators: When the External Device is connected, indicator is lights up.
- 2. MP3/WMA indicators: When the Audio Stream is detected, indicator is lights up.
- Stereo [ST] indicator for FM stereo station: When a stereo Broadcast is received, indicator is lights up.
- 4. Playback mode indicators for USB mode

: Folder mode

INT: Intro playback

: Repeat playback

: Random playback

5. LOUD/EQ indicators for sound effect

LOUD: Loudness mode on

EQ: EQ mode on

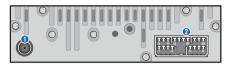
Multi-function display area for showing the information

Wired remote controller



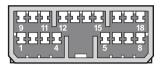
- SCAN button: In Radio mode, tune up the frequency(press): find a station (press and hold).
- POWER [PWR] button: Turn on the power or mute on/off(press): turn off the power (press and hold).
- Volume [▲/▼] buttons: Adjust the volume.

Rear view/Connectors



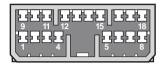
- 1. Antenna jack: To plug the FM antenna cable.
- 2. I/O connector: To plug the 1/0 cable.

<ARA-5080WF: 18 Pin>



- 1. Front R (+)
- 2. Rear R (+)
- 3. Illumination (+)
- 4. ACC (+)
- 5. Battery (B+)
- 6. N.C
- 7. Rear L (+)
- 8. Front L (+)
- 9. Front R (-)
- 10. Rear R (-)
- 11. N.C / Illumination (-)
- 12. N.C
- 13. REM GND
- 14. GND
- 15. 5V Output
- 16. REM Data
- 17. Rear L (-)
- 18. Front L (-)

<ARA-5081WF: 18 Pin>



- 1. Tel Mute
- 2. Rear R (+)
- 3. Illumination (+)
- 4. ACC (+)
- 5. Battery (B+)
- 6. DMB GND
- 7. Rear L (+)
- 8. DMB L-CH
- 9. H/F GND
- 10. Rear R (-)
- 11. DMB Det
- 12. DMB Mute
- 13. REM GND
- 14. GND
- 15. 5V Output
- 16. REM Data
- 17. Rear L (-)
- 18. DMB R-CH

Getting started

Turning the unit on/off



 Turn your car's ignition key to ACC or IGN (ON) position.

Displays the current time.



2. Press the **POWER** button to turn the power on.

If the source is ready, playback also starts.

To turn on the power directly

By connecting an USB into the USB port or pressing the AM/FM or USB button (while the USB device is connected), you can also turn on the power and the unit then plays.



3. When power is on, press and hold the **POWER** button to turn power off.

Adjusting volume directly



1. Turn the VOLUME dial to control volume.

Available volume range: 1 - 41.

Setting the sound



- Press MENU button repeatedly to select the Sound setting mode as below:
 - BAS (Bass): sets the bass sound level. (-5 ~ +5)
 - MID (Middle): sets the middle sound level. (-5 ~ +5)
 - TRE (Treble): sets the treble sound level. (-5 ~ +5)
 - FAD (Fader: Option): sets the sound fade between the front and rear speakers. (F15 ~ R15)
 - BAL (Balance): sets the sound balance between the right and left speakers. (L 15 ~ R15)
 - LOUD (Loudness): turn Loudness mode on/off
 - EQ (Equalizer style): selects the one of the 7 EQ styles (EQ OFF, POP, ROCK, COUNTRY, VOICE, JAZZ, CLASSIC)
 - BEEP (Beep): turn Beep sound on/off
 - SCROLL (Scroll): turn Scroll mode on/off
 - VOL (Volume): sets the sound volume level. (VOL 0 ~ VOL 41)



2. Turn the **VOLUME** dial left/right to adjust the value of the level, balance or style.

Setting the Loudness mode



 Press the LOUD button to turn loudness mode on/off.

Increases the level for low frequency.

To turn the loudness option off, press the **LOUD** button again.

Muting the sound quickly



 Press the MUTE button to turn mute on. "MUTE" will flash on the display and mute the sound.

Press the **MUTE** button again or turn **VOLUME** dial to restore sound.

Radio

Setting the region of radio reception

- When the power is turned on, press and hold the buttons more 3 seconds at the same time as below:
- U.S.A: Hold down and press

 THEND HORSE THE MENU more 3 seconds

FM: 87.7 - 107.9 MHz (200 kHz step)

AM: 530 - 1.7 10 kHz (10kHz step)

South America : Hold down and press more 3 seconds

FM: 87.5 - 108.0 MHz (100 kHz step)

AM: 530 - 1.7 10 kHz (10kHz step)

Asia : Hold down and press

 To + MENU more 3 seconds

FM: 87.5 - 108.0 MHz (100 kHz step)

AM: 531 - 1,602 kHz (9 kHz step)

Europe: Hold down 2 RPT and press

FM: 87.5 - 108.0 MHz (50 kHz step)

AM: 522 - 1,629 kHz (9 kHz step)

2. Please wait for more 5 seconds with no operation, the unit will save and apply your's setting.

If the region setting is not selected correctly to your country or region, the radio reception can not be received. Retry the setting the region of radio reception correctly.

The region setting is required only for the first

The region setting is return to the default setting when the power connector or battery is disconnected.

Tuning in a station



 Press the AM or FM button to change the band in order of AM1. AM2. FM1 or FM2.

You can select the FM 1. FM2. AM 1 or AM2 radio band

While the Auto 5tore stations are stored, you can select the AMA or FMA band by additional.

The previously chosen broadcasting station will be received.



Press the SCN button or turn the | ◀ ▼ TUNE
 ▶ | dial left/right to select the station.

Using TUNE: Briefly turn the dial, plays previous/next frequency.

Using SEEK: Turn and hold the dial, automatically search for station with superior reception.

Using SCAN: Press the button, starting from the current station, stations with superior reception are scanned for 5 seconds and the previous station is restored.

During the seeking or scanning, if press or turn the dial left/right again, the selected station will begin playing.

During the FM reception, the Stereo [ST] indicator is on.

Radio

Saving radio stations manually

You can save up to 6 preset channels each for FM 1, FM2, FMA, AM 1, AM2, and AMA.

If change the stations while driving, use preset button to prevent accidents.

 Press the AM or FM button repeatedly to select the band.



 After selecting the frequency, press and hold the PRESET [1 ||] - [6 D+] button.

The frequency is saved to the selected preset button.

A total of 24 frequencies with 6 preset frequencies each for FM1/FM2/AM1/AM2 modes can be saved.

Saving radio stations automatically



 Press the AM or FM button repeatedly to select the band.

The previously chosen broadcasting station will be received.



Press and hold the AST button to automatically save receivable frequencies to Preset button.

"AST" is shown, and then stores stations in the order of their frequencies on the Preset buttons.

Up to 6 stations can be stored in each of the AMA and FMA band

Listening to a preset station



 Press AM or FM button repeatedly to select the band.

You can select the FM 1. FM2. AM 1 or AM2 radio band.

While the Auto Store stations are stored, you can select the AMA or FMA band by additional.

The previously chosen broadcasting station will be received.



2. Press Preset [1 ||] - [6 D+] button.

From the 6 presets, select the frequency you want to listen to.

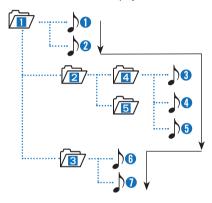
USB player

Before MP3 [WMA] USB playback

This unit cannot play the following files;

- MP3 files encoded with MP3i and MP3 PRO format.
 - MP3 files encoded in an inappropriate format.
 - MP3 files encoded with Layer 1/2.

Folder selection order/File playback order;



Playing a USB device



Open the cover, plug the USB device to the USB port.

Once a USB is connected, USB will automatically start playing from the first file within the USB.

If a previously played USB is reconnected, then the file after the most recently played file is played.

If a different USB is connected or the file information within the USB was changed, then the USB will start playing from the first song within the USB.



When a USB device to be played is already connected, press the USB button to play USB device.

The previously selected file is played.



 While playing, press the [1 | |] button to pause the file.

Press the button again to play the current file.



4. Press the [4 INFO] button repeatedly to display information about the file being played.

The information displayed includes the file name, playing time, ID3 Tag or folder name information saved with the song.

If there is no information on the playing file, then the unit will display "**NO INFO**".



- Press MENU button repeatedly to select the Scroll setting mode. Tum the VOLUME dial to changes the display method between Scroll On/Off.
 - · SCROLL ON: activate the scroll function
 - SCROLL OFF: deactivate the scroll function

Controlling the playback



- While playing, turn the ►► | TRACK | ◀ ◀ dial left/right to moves to the previous or next track.
 - Clockwise: move to the next file

Counter-clockwise: move to the previous file

• You can skip files within the same folder.



- While the ►► | TRACK | ◀ dial is being turned and held, the file will rewind or fast forward at high speed. Once released, the file will begin playing at normal speed.
 - · Clockwise: fast forward
 - · Counter-clockwise: fast rewind
 - The search function works but search speed is not constant.
 - While fast forwarding or rewinding, you can only hear intermittent sounds.



- 3. Press the [5 D-] or [6 D+] button to moves to the previous or next folder.
 - [5 D-]: move to previous folder

[6 D+]: move to next folder



 While folder moving, he folder name will be displayed briefly.

Change the playback mode



- 1. While playing, press the SCN button to begin the Intro scan playback.
 - When pressed shortly, scans the beginning parts of device files. (approx. 10 seconds per file)
 - INT : Successively plays the intro of the file in the USB device.
 - LT: Successively plays the intro of the file in the current folder.
 - Off: Cancels intro playback.



- 2. Press the [2 RPT] button to select the Repeat playback mode.
 - CD : The current file plays repeatedly.
 - CD : The current folder plays repeatedly.
 - · Off: Cancels repeat playback.



- Press the [3 RDM] button to select the Random playback mode.
 - Carrent folder play in random order
 - X : All files of USB device play in random order
 - · Off: Cancels random playback.

About MP3/WMA

This unit can play MP3 (WMA) files with .mp3, .wma (lower case letters) or .MP3 and .WMA (capital letters) file name extensions.

This unit can display ID3 Tag (Version 1.0, 1.1, 2.2, 2.3 or 2.4) information for MP3 files. such as the album name and the artist.

This unit can recognize the Korean and English characters.

This unit can play MP3/WMA files meeting the conditions below:

- Bit rate: 8 kbps 320 kbps / VBR for MP3
- Sampling frequency:

48 kHz, 44.1 kHz, 32 kHz

(for MPEG-1 Layer 2/3)

24 kHz, 22.05 kHz, 16 kHz

(for MPEG-2 Layer 2/3)

This unit can recognize total of 9,999 files, of 256 folders, and 7 stages of folder structure.

This product can play MP3 files using VBR. When playing an MP3 file of this VBR type, the remaining time displayed may be different from the real time.

Handling precautions for USB device

When using the external USB device, make sure to keep the device disconnected and connect only sometime after turning on the vehicle ignition. The USB device may be damaged if the USB device already connected when the ignition is turned on. (USB device is not an electronic automotive component).

Some USB devices may not operate properly because of compatibility issues. Check that the external device is supported by the device before stating use.

The device will only recognize USB devices formatted in FAT 16/32.

When formatting the external USB device, the device may not properly recognize a Byte/Sector selection other than 512 Bytes or 2,048 Bytes.

Avoid the contact of bodily parts and foreign substances with the USB connector.

Repeatedly connecting/disconnecting the USB in a short period of time may cause damage to the

device.

When disconnecting the USB, an abnormal sound may occur occasionally.

Abruptly disconnecting the external USB device while the USB is operating may cause the device to be damaged or function abnormally. Make sure to disconnect the USB device only after the audio power is turned off or when the audio is operating in a different mode.

The amount of time required to recognize the external USB device may differ depending on the type, size, or file formats stored on the USB. Such differences in the required time are not indications of malfunction. Please wait the period of time required to recognize the device.

The device support only USB devices used to play music files.

Do not use the USB I/F to charge batteries or USB accessories which generate heat. Such acts may lead to deteriorated performance or damage to the device

The device may not recognize the USB device if separately purchased USB hubs and extension cables are being used.

In the case of high capacity USB devices, there are instances where the logical drives are partitioned for user convenience. In this case, it will only be possible to play the USB music in the top level drive. When using partitioned drives, save the songs you wish to play on the device only in the top-level logical drive. In addition, certain USB devices are configured with a separate drive used to install application programs and it may not be possible to play songs from such drives for the reasons as described above.

The device may not support normal operation when using formats such as HDD Type, CF, or SD Memory.

The device will not support files locked by DRM (Digital Rights Management).

AUX plaver

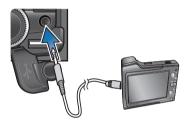
Listening to auxiliary audio equipment

By connecting an optional portable audio device to the AUX input jack (stereo mini jack) on the unit and then simply selecting the source, you can listen on your car speakers.



 Turn the VOLUME dial left to decrease the volume level.

The **AUX** volume can also be controlled separately through the connected device.



- Turn the external audio equipment off Open the cover, connect the audio output of the external audio equipment to AUX input terminal on the unit.
- Turn the external audio equipment on. Start playback of the external audio equipment at a moderate volume.



4. Press the AUX button to select the AUX function.



Set your usual listening volume by turn the VOLUME dial left/right on the unit.

Once the connector is disconnected, the previous mode will be restored.

AUX mode can be used only when an external audio player has been connected.

Listening to DMB sound (If Equipped)

 By connecting the optional DMB receiver, you can listen the DMB source provided for the vehicle.

When the DMB receiver is turned power on, the current operation will be paused and the "AUX 1" will be displayed on the Display window.

The DMB's sound is output from the speakers in the unit.

- 2. While playing the DMB, press the AM, FM or USB button to change the function.
- **3.** While playing the DMB, if turn the DMB receiver off, the unit will be returned to previous mode.

Calling via Handsfree (If Equipped)

 By connecting the optional Handsfree equipment, you can use the the Handsfree mode.

When make a call or receive, the bell will sound and the "PHONE" will be displayed on the Display window.

- 2. The ringtone and talker's voice are output only from the front speakers.
- 3. When the call is ended, the mute will be canceled and the unit will be returned to the previous mode.

Seat Switch System (If Equipped)



The lift truck is equipped with a SEAT SWITCH SYSTEM. In normal operation if the direction lever is placed in either forward or reverse, the lift truck will move at a speed proportional to the accelerator pedal's position. If the operator leavers the seat without setting the parking brake, within three seconds after leaving the seat, the SEAT SWITCH SYSTEM will automatically disengage the transmission. The directional lever, however, will remain in that forward or reverse location although internally the transmission will have shifted into neutral.

Before exiting the lift truck, the parking brake should always be applied.

WARNING

WHEN LEAVING MACHINE APPLY PARKING BRAKE!

PARKING BRAKE IS NOT AUTOMATICALLY APPLIED.

NOTE: Some trucks may be equipped (ask your dealer if this applies to your truck) with an alarm that will sound if the parking brake is not applied when leaving the machine.

NOTICE

- Prior to operating the lift truck, be sure to understand and check the SEAT SWITCH SYSTEM.
- 2. While in normal operation and on level ground, select a direction with the directional lever and with the park brake released. You will note that the truck will move slowly in the selected direction. If you lift yours hips off of the seat, within three seconds, the SEAT SWITCH SYSTEM will desengage the transmission allowing the truck to coast but not automatically stop.
- 3. To restore the lift truck to normal operation, while sitting in the operator's seat depress the brake pedal to hold the lift truck, return the directional lever to the neutral position, and then reselect a direction of travel (either forward or reverse). The transmission will then re-engage.
- If seat or seat switch replacement becomes necessary, be sure to use genuine DOOSAN lift truck parts. Lift trucks should never be operated without an operational SEAT SWITCH SYSTEM.

Lift Truck Controls

Direction Control Lever





1. Forward - Push the lever forward for FORWARD direction travel.



2. **Neutral** - Move the lever to center position for NEUTRAL.



3. Reverse - Pull the lever back for REVERSE direction travel.

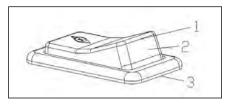
Transmission Speed Range Lever



- High Rotate the lever counterclockwise for HIGH speed range.
- Low Rotate the lever clockwise for LOW speed range.

IDLE Selection Switch

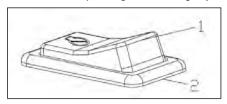
This switch is to control the IDLE RPM of the engine.



- Placing the switch at the "1" position raises the engine's idle speed in increments of 50 RPM up to 1,600 RPM from its default of 850 RPM.
- Placing the switch at the "2" position keeps the engine's current idle speed.
- Placing the switch at the "3" position during 1.5 seconds turns the engine's idle speed back to its default of 850 RPM.
- Once you push the accelerator pedal while holding the switch at the "1" position and then take out the hand from it, the engine keeps the raised idle speed.
- * If you would use this function after starting up the engine, place the switch at the "3" position initially to open the function.

Emergency Engine Brake Switch

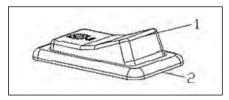
This switch is to stop the engine in an emergency.



- 1. Placing the switch at the "1" position stops the engine.
- 2. The engine keeps its operation while the switch is placed at the "2" position.

Multi-torque Switch

This switch is to change the vehicle's dirve mode.



- 1. Placing the switch at the "1" position operates the vehicle in the "ECO mode" for higher mileage.
- **2.** The vehicle keeps the normal operation while the switch is placed at the "2" position.

SCR Cleaning - DeSOx Switch

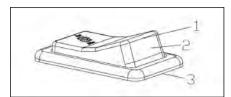


This switch initiates regular regeneration process of the post-treatment device.

1) A pop-up on the SCR Display warns the operator to perform SCR Cleaning. (3 warnings: at 10 hrs remaining, 5 hrs remaining, Immediate)



<Exemplary warning - 10 hrs remaining>



 Press this switch and release it after 3 sec, SCR Cleaning will be started and the engine speed will be increased. Screen pop-up provides information on the warning up and cleaning process.



<Warming up process>



<Cleaning process>



<Completed>

- 3) The switch returns to the normal position of "2" after pressed by the operator to position "1". However, it does not return when pressed to position "3" and the operator shall return the switch from position "3".
- 4) Setting this switch to position "3" prohibits automatic SCR Cleaning in an environment subject to dust, explosion or regulated noise level. At position "3", a pop-up appears as shown below:



<SCR Cleaning inhibited>

Transmission Inching Control Pedal





Inching Control Pedal - Pushing down the inching pedal, modulates the hydraulic pressure to the clutch packs, permitting disc slippage.

Further pushing the pedal completely relieves clutch pack pressure and applies the service brakes to stop and hold the lift truck.

NOTE: The purpose of the inching control pedal is to provide precise inching control at slow travel speed, with high engine rpm. This is used for fast hydraulic lift during load approach, pickup or positioning.

Service Brake Pedal



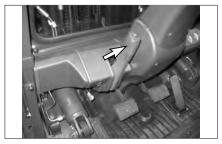


Push DOWN on the brake pedal to slow or stop the lift truck.



RELEASE the brake pedal to allow the lift truck to move.

Parking Brake Lever





Pull the lever BACK to engage the parking brake.



Push the lever FORWARD to release the parking brake.

Accelerator Pedal





Push DOWN on the pedal to increase engine rpm (speed).



RELEASE the pedal to decrease engine rpm (speed).

Lift Control



NOTE: To prevent a sudden change of position of the load, operate all lift, tilt and attachment controls smoothly.



1. Lower Position - Push the lever FORWARD smoothly to lower the load.



2. Hold Position - When the lever is released it will return to the HOLD or center position. Lifting or lowering action will stop.



3. Lift $\mbox{Position}$ - \mbox{Pull} the lever BACK smoothly to lift the load.

Tilt Control





1. **Mast Tilt Forward** - Push the lever FORWARD smoothly to tilt the mast forward.

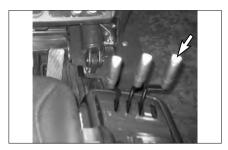


2. Mast Hold - When the lever is released it will return to the HOLD or center position. Tilting action will stop.



3. Mast Tilt Back - Pull the lever BACK smoothly to tilt the mast backward.

Sideshift Attachment Control (If Equipped)





1. Sideshift Left - Push the lever FORWARD to shift the carriage to the left.



2. Sideshift Hold - When the lever is released it will return to the HOLD or center position. Sideshifting action will stop.



3. Sideshift Right - Pull the lever BACK to shift the carriage to the right.

Fuel and DEF/Ad-Blue Replenishment

Diesel Engine Equipped

₩ WARNING

Explosive fumes may be present during refueling.

Do not smoke in refueling areas.

Lift truck should be refueled only at designated safe locations. Safe outdoor locations are preferable to those indoors.

Stop the engine and get off the lift truck during refueling.

NOTICE

Do not allow the lift truck to become low on fuel or completely run out of fuel. Sediment or other impurities in the fuel tank could be drawn into the fuel system. This could result in difficult starting or damage to components.

Fill the fuel tank at the end of each day of operation to drive out moisture laden air and to prevent condensation. In the cold weather, the moisture condensation can cause rust in the fuel system and hard starting due to its freezing. Do not fill the tank to the top. Fuel expands when it gets warm and may overflow.



 Park the lift truck only at a designated safe location. Place the transmission in NEUTRAL. Lower the forks to the ground. Engage the parking brake. Stop the engine.



- 2. Remove the filter cap.
- Fill the fuel tank slowly. Install the filter cap. If spillage occurs, wipe off excess fuel and wash down area with water.

NOTE: Drain water and sediment from fuel tank as required by prevailing conditions. Also, drain water and sediment from the main fuel storage tank weekly and before the tank is refilled. This will help prevent water or sediment being pumped from the storage tank into the lift truck fuel tank.

DEF/Ad-Blue Replenishment

NOTICE

Do not allow the lift truck to become low on DEF(Ad-Blue) or completely run out of /DEF (Ad-Blue). Sediment or other impurities in the DEF(Ad-Blue) Tank could be drawn into the after treatment. This could result in damage to components.

Do not fill the DEF(Ad-Blue)tank to the top. DEF(Ad-Blue) Tank could be damaged because of volume expansion during DEF(Ad-blue) freezing in cold condition.



Example

- Park the lift truck only at a designated safe location. Place the transmission in Neutral. Lower the forks on the ground. Apply the parking brake. Stop the engine.
- Using the start key, open the DEF/Ad-Blue tank door beside the frame. Open the blue DEF/Ad-Blue tank filler cap.



Typical Example

- Fill the DEF/Ad-Blue tank slowly. Refer to the section on 'Fuel and DEF/Ad-Blue Refill Volume."
- After the refill, close the DEF/Ad-Blue tank cap firmly. Remove spilt DEF/Ad-Blue, if any, with an adsorbent.

CAUTION

LOW DEF/Ad-Blue LEVEL WILL DISTURB AFTER TREATMENT FOR EPA TIER-IV (EURO STAGE IV) EXHAUST GAS EMISSION, AND CAN BE CAUSE OF SERIOUS DAMAGE TO ENGINE AND SYSTEM.

Before Starting the Engine

Walk - Around Inspection

Make a thorough walk-around inspection before mounting the lift truck or starting the engine. Make sure there are no such problems as loose bolts, debris buildup, oil or coolant leaks. Check condition of tires, mast, carriage, forks or attachments. Have repairs made as needed and all debris removed.



- Inspect the operator's compartment for loose items and cleanliness.
- Inspect the instrument panel for broken or damaged indicator lights or gauges.
- Test the horn and other safety devices for proper operation.



- 4. Inspect the mast and lift chains for wear, broken links, pins and loose rollers.
- Inspect the carriage, forks or attachments for wear, damage and loose or missing bolts.
- Inspect the tires and wheels for cuts, gouges, foreign objects, inflation pressure and loose or missing bolts.



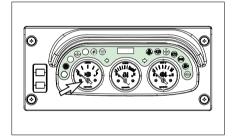
- 7. Inspect the overhead guard and cabin for damage and loose or missing mounting bolts.
- Inspect the hydraulic system for leaks, worn hoses or damaged lines.
- Look for transmission and drive axle leaks on the lift truck and on the ground.
- Inspect the engine compartment for oil, coolant and fuel leaks.
- Inspect the engine compartment for oil, coolant and fuel leaks.



 Measure the engine crankcase oil level with the dip stick. Maintain the oil level between the MAX. and MIN., (or FULL and ADD) notches on the dip stick.



13. Observe the engine coolant level in the coolant recovery bottle. With the engine cold, maintain the level to the COLD mark. If the recovery bottle is empty, also fill the radiator at the top tank.



14. Observe the fuel level gauge after starting the truck. Add fuel if necessary

WARNING

Personal injury may occur from accidents caused by improper seat adjustment. Always adjust the operator's seat before starting the lift truck engine.

Seat adjustment must be done at the beginning of each shift and when operators change.



15. To position the seat, PUSH the lever away from the seat track and move the seat forward or backward to a comfortable position.

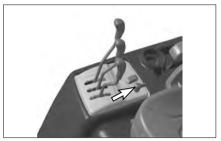
Starting the Engine

Prestart Conditions

NOTE: The engine will not start unless the transmission directional control lever is in the NEUTRAL position.



 Engage the parking brake, if not already engaged. Place the transmission directional control lever in the NEUTRAL position.

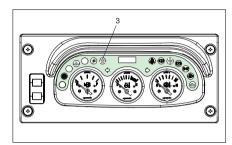


In case the lift truck is equipped with a electrical disconnect switch, the engine will not start unless the disconnect switch is in the ON (closed) position. Before starting, turn the disconnect switch to the OFF(open) position.

NOTICE

When you restart the engine after turning off it, wait 4 to 5 seconds and restart it to protect the starter.

Diesel Engine Starting a Cold Diesel Engine



 Turn the key to the ON position and the start preheat indicator light will come ON. The preheat indicator light will stay ON approximately seven seconds, depending on the surrounding air temperature.

NOTICE

Do not crank more than 10 seconds continuously.

If engine coolant is cold, engine low idle speed could be higher than normal condition.

- When the preheat indicator light goes OFF, turn the key to the START position, with the accelerator pedal fully depressed.
- 3. Release the ignition key after engine starting and check the engine condition.
- **4.** If the engine stalls or does not start, turn the key to the OFF position, then repeat steps 1 thru 3.

Starting From a 12 Volt External Source

⚠ WARNING

Sparks occurring near the battery could cause vapors to explode.

Always connect the external power source ground cable to a point away from and below the battery, and well clear of fuel system components.



NOTICE

Do not reverse battery cables. It can cause damage to the alternator.

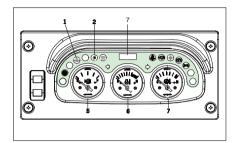
Always connect the external power source cables in parallel with the lift truck battery cables: POSITIVE(+) to POSITIVE(+) and NEGATIVE(-) to NEGATIVE(-).

Attach ground cable last, and remove it first. All lift trucks equipped with DOOSAN built internal combustion engines have NEGATIVE(-) ground connections.

After Starting the Engine

Observe all indicator lights and gauges frequently during operation, to make sure all systems are working properly. All of the indicator lights will come ON with the ignition switch in the ON position before the engine is started

Diesel (12V)





 The engine oil pressure indicator light (1), will not come ON with the engine running, unless there is low or no oil pressure. Stop the engine immediately, if the light comes ON.



2. The alternator indicator light (2), should not come ON during normal operation. The alternator is not charging if the light comes ON with the engine running.



3. The engine MIL (Malfunction Indicator Light)(3) will not come ON with engine running, unless the faults are stored in the memory of

the engine control module (ECM). Stop the engine and check the electric engine control system if the light comes ON. Refer to D34NAP/D34P Engine of this section.



4. Observe the diesel fuel level gauge (4) for fuel level in the tank.(Diesel Engine Only)



The engine coolant temperature gauge pointer (5), will be in the green band with the engine running, unless the coolant temperature is excessive.



6. The power shift transmission oil temperature gauge pointer (6), will be in the green band with the engine running, unless the oil temperature is excessive.

7. Observe the hour meter (7) to make sure it is operating properly.

Diesel Engine

Engine and After-treatment System

Introduction

The D34 engine which is a high-power engine in compliance with the EPA/CARB TIER-4 (EURO STAGE IV) Engine Emissions Standard is provided with various systems. The D34 engine is equipped with a turbo charger intercooler system that compresses and cools air and feeds it to the intake manifold. Here, MAF sensor and temperature/pressure sensors detect the air condition and transmit the data to the ECU which controls fuel injection rate according to the engine load, speed and air quantity. Fuel is supplied to a high pressure pump through a fuel filter. The fuel compressed in the high pressure pump is transferred to common rail and injected by injectors in the order in which the fluids are controlled. Surplus fuel after injection returns to the fuel tank via a return hose. The exhaust gas recirculation (EGR) system controls the quantity of recirculating air according to the engine speed and load in order to comply with applicable exhaust gas emission standards

The DOC (Diesel Oxidation Catalyst) uses a chemical process to reduce hydrocarbons(HC) and carbon monoxide(CO). SCR (Selective Catalytic Reduction) as after-treatment is the process by which the oxides of nitrogen (NOx) contained in diesel exhaust are reduced to nitrogen (N2) and water (H2O). For SCR process, DEF (Diesel Exhaust Fluid or Ad-Blue) is required.

The figure below shows the positions of the electronic control system and sensors.

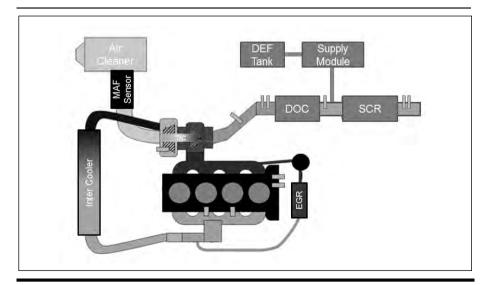
NOTICE

It is normal to hear a slight knocking or pinging sound from the engine during operation. This is the ECU regulating the amount of fuel necessary for fuel injection to meet emission standards.

When the engine is regularly turned off using the ignition key after operation, the supply module starts up (after-run) in order to remove the DEF/Ad-Blue remaining in the after-treatment system by returning it into the DEF tank. This is to prevent the hose from bursting due to a freeze-up or any other kind of obstruction. A sound is produced during the after-run.

- Do not cut off the battery's main supply during the after-run.
- If the after-run does not begin after the engine is turned off, inspect the system.

White Smoke can be emitted during SCR Cleaning.



Detecting Control Failure

As shown in the table below, the ECU / DCU performs self diagnosis. If a fault/failure is detected, engine check lamp lights up and failure code (DTC) is indicated by the number of flashes of the engine check lamp. To check failure code(DTC) refer page .48 #6 Engine Check Lamp(RED) section.

ECU Fault List

DTC	Description	LAMP	TRQ	Limphome Mode	Engine STOP in 5minutes
P0402	EGR Air High Fault	ON	50%		
P0401	EGR Air Low Fault	ON	50%		
P0406	EGR Position Sensor High Fault	ON	50%		
P0407	EGR Position Sensor Low Fault	ON	50%		
P046D	EGR Position Sensor Noise Fault	ON	50%		
P0C17	EGR Close Position Learning Drift Fault	ON	50%		
P0C18	EGR Close Position Learning Range Fault	ON	50%		
P0088	Over Pressure IMV Fault	FLASH			0
P0089	Rail Pressure Control Stability Positive Fault	-	-		
P0089	Rail Pressure Control Stability Negative Fault	-	-		
P2267	Water In Fuel Sensor OC/SCB Fault	FLASH	80%		
P2266	Water In Fuel Sensor SCG Fault	FLASH	80%		
P2269	Water In Fuel Detected Fault	FLASH	80%		
P0524	Oil Pressure Low Fault	FLASH			0
P0523	Oil Pressure Sensor High Fault	ON	50%		
P0522	Oil Pressure Sensor Low Fault	ON	50%		
P0111	Intake Manifold Temperature Plausibility Fault	-	-		
P0113	Intake Manifold Temperature Sensor High Fault	ON	50%		
P0112	Intake Manifold Temperature Sensor Low Fault	ON	50%		
P0114	Intake Manifold Temperature Sensor Noise Fault	ON	50%		
P0108	Manifold Pressure Sensor High Fault	ON	50%		
P0107	Manifold Pressure Sensor Low Fault	ON	50%		
P2229	Atmospheric Sensor High Fault	ON	50%		
P2228	Atmospheric Sensor Low Fault	ON	50%		
P0116	Coolant Temperature Plausibility Fault	-	-		
P0118	Coolant Temperature Sensor High Fault	ON	80%		
P0117	Coolant Temperature Sensor Low Fault	ON	80%		
P00BD	MAF Plausibility High Fault	ON	50%		
P00BC	MAF Plausibility Low Fault	ON	50%		
P0103	MAF sensor High Fault	ON	50%		
P0102	MAF sensor Low Fault	ON	50%		

DTC	Description	LAMP	TRQ	Limphome Mode	Engine STOP in 5minutes
P0190	Rail Pressure Sensor Gradient Fault	FLASH			0
P0193	Rail Pressure Sensor High Fault	FLASH			0
P0192	Rail Pressure Sensor Low Fault	FLASH			0
P0087	Rail Pressure Build-up Fault	ON	-		
P0191	Rail Pressure Sensor Drift Fault	FLASH			0
P0002	Rail Pressure Control Fault (IMV only)	FLASH			0
P0089	Rail Pressure Control Fault (Rail Discharge)	FLASH			0
P0563	Battery Voltage High Fault	ON	50%		
P0562	Battery voltage Low Fault	ON	50%		
P0074	Inlet Air Temperature Gradient Fault	ON	50%		
P0073	Inlet Air Temperature Sensor High Fault	ON	50%		
P0072	Inlet Air Temperature Sensor Low Fault	ON	50%		
P2428	Exhaust Over Temperature Fault	ON	50%		
P0181	Fuel Temperature Gradient Fault	ON	50%		
P0183	Fuel Temperature Sensor High Fault	ON	50%		
P0182	Fuel Temperature Sensor Low Fault	ON	50%		
P0196	Oil Temperature Plausibility Fault	-	-		
P0195	Oil temperature Sensor Fault	ON	50%		
P060B	Analog To Digital Convertor Fault	-	-		
P0602	Injector Code Program Fault	ON		0	
P0603	ECU Memory Fault (Data / Cal Integrity)	FLASH	-		
P0604	ECU Memory Fault (RAM Integrity)	FLASH	-		
P0605	ECU Memory Fault (Code Integrity)	FLASH	-		
P062F	ECU Non-volatile Memory Fault	-	-		
P0371	Crank Signal Early Fault	-	-		
P0339	Crank Signal Gap Fault	ON	50%		
P0372	Crank Signal Missing Fault	ON	50%		
P0374	Crank Signal Lost Fault	ON	50%		
P0335	Crank Signal Over-speed Fault	-	-		
P0344	Cam Signal Missing Fault	ON	50%		
P0342	Cam Signal Lost Fault	ON	50%		
P0341	Cam Signal Drift Fault	-	-		
P0340	Cam Signal Learning Fault	-	-		
P0201	Injector Open Fault (Cylinder #1)	ON	50%		
P02EE	Injector Short Fault (Cylinder #1)	ON	50%		
P0262	Harness Resistance High Fault (Cylinder #1)	-	-		

DTC	Description	LAMP	TRQ	Limphome Mode	Engine STOP in 5minutes
P0261	Harness Resistance Low Fault (Cylinder #1)	-	-		
P029B	Injector Minimum Drive Pulse Drift Fault (Cylinder #1)	ON	-		
P0202	Injector Open Fault (Cylinder #2)	ON	50%		
P02EF	Injector Short Fault (Cylinder #2)	ON	50%		
P0265	Harness Resistance High Fault (Cylinder #2)	-	-		
P0264	Harness Resistance Low Fault (Cylinder #2)	-	-		
P029F	Injector Minimum Drive Pulse Drift Fault (Cylinder #2)	ON	-		
P0203	Injector Open Fault (Cylinder #3)	ON	50%		
P02F0	Injector Short Fault (Cylinder #3)	ON	50%		
P0268	Harness Resistance High Fault (Cylinder #3)	-	-		
P0267	Harness Resistance Low Fault (Cylinder #3)	-	-		
P02A3	Injector Minimum Drive Pulse Drift Fault (Cylinder #3)	ON	-		
P0204	Injector Open Fault (Cylinder #4)	ON	50%		
P02F1	Injector Short Fault (Cylinder #4)	ON	50%		
P0271	Harness Resistance High Fault (Cylinder #4)	-	-		
P0270	Harness Resistance Low Fault (Cylinder #4)	-	-		
P02A7	Injector Minimum Drive Pulse Drift Fault (Cylinder #4)	ON	-		
P0384	Glow Plug Relay SCB Fault	-	-		
P0383	Glow Plug Relay SCG Fault	-	-		
P0380	Glow Plug Relay OC Fault	-	-		
P0325	Accelerometer Sensor 0 Fault	-	-		
P0330	Accelerometer Sensor 1 Fault	-	-		
P0007	Rail Pressure Control Fault (Trim High)	FLASH			0
P0006	Rail Pressure Control Fault (Trim Low)	FLASH			0
P0004	IMV Current Feedback High Fault	FLASH			0
P0003	IMV Current Feedback Low Fault	ON	50%		
P0259	IMV Current Trim Drift High Fault (High Fuelling)	-	-		
P0254	IMV Current Trim Drift High Fault (Low Fuelling)	-	-		0
P0253	IMV Current Trim Drift Low Fault (High Fuelling)	-	-		
P0258	IMV Current Trim Drift Low Fault (Low Fuelling)	-	-		
P0252	IMV Rail Pressure Control PWM Fault	ON	50%		
P0251	IMV Rail Pressure Control Fault (Trim Drift)	ON	50%		
P2080	Turbo In Temperature Plausibility Fault	-	-		
P0546	Turbo In Temperature Sensor High Fault	ON	50%		

DTC	Description	LAMP	TRQ	Limphome Mode	Engine STOP in 5minutes
P0545	Turbo In Temperature Sensor Low Fault	ON	50%		
P2081	Turbo In Temperature Sensor Noise Fault	ON	50%		
P0685	Main Relay Stuck Fault	-	-		
P068A	Main Relay Drop Fault	ON	-		
P062D	Injector Bank 1 SCB Fault	FLASH	-		
P062D	Injector Bank 1 SCG Fault	FLASH	-		
P062D	Injector Bank 1 SPI Fault	FLASH	-		
P062E	Injector Bank 2 SCB Fault	FLASH	-		
P062E	Injector Bank 2 SCG Fault	FLASH	-		
P062E	Injector Bank 2 SPI Fault	FLASH	-		
P2145	EGR H-Bridge Driver SCB Fault	ON	50%		
P2144	EGR H-Bridge Driver SCG Fault	ON	50%		
P2143	EGR H-Bridge Driver OC Fault	ON	50%		
P0404	EGR Position Control Fault	ON	50%		
P0641	5V Sensor Supply #1 Fault	FLASH	50%		
P0651	5V Sensor Supply #2 Fault	FLASH	50%		
P0697	5V Auxiliary Sensor Supply Fault	FLASH	50%		
P025D	IMV Drive SCB Fault	FLASH			0
P025C	IMV Drive SCG Fault	FLASH	80%		
P025A	IMV Drive OC Fault	FLASH			0
P061B	ECU Safety Monitoring Fault	FLASH	speci al		
P0409	EGR actuator position feedback signal ADC fault	-	-		
P2264	Water in Fuel sensor electrical fault (ADC)	-	-		
P0110	TMAP Temperature Element sensor ADC fault	-	-		
P0105	Manifold Pressure sensor electrical ADC fault	-	-		
P2226	Barometric pressure sensor electrical ADC fault	-	-		
P0100	MAF sensor electrical ADC fault	-	-		
P0070	Inlet Air Temperature sensor ADC fault	-	-		
P0001	Rail pressure control feedback ADC fault	-	-		
P0544	Turbo in temperature sensor ADC fault	-	-		
P0101	Intake air path leakage, MAF sensor drift, damage of MAF sensor	-	-		
P1650	Check engine lamp fault	-	-		
P0115	Coolant temperature sensor mother fault	-	-		
P0403	OC/SC2G/SC2Vbatt was generated in EGR H-bridge driver	-	-		

DTC	Description	LAMP	TRQ	Limphome Mode	Engine STOP in 5minutes
P0381	Glow plug lamp fault	-	-		
P0711	Transmission oil temperature is out of range	ON	50%		
P2135	Pedal position sensor 1,2 voltage correlation	ON		0	
P060D	Pedal position performance out of range	ON		0	
P0120	Pedal position sensor 1 fault	ON	-	0	
P0220	Pedal position sensor 2 fault	ON	-		
P2544	Multi torque switch has ADC problem	-	-		
P2547	Multi torque switch is above than operation range	ON	-		
P2546	Multi torque switch is under than operation range	ON	-		
P0606	ECU Safety monitoring fault	-	-		
P0607	ECU Safety monitoring fault	-	-		
P060A	ECU Safety monitoring fault	-	-		
P060C	ECU Safety monitoring fault	-			
P25BC	DeSOx Switch SCB Fault	ON	-		
P25BB	DeSOx Switch SCG Fault	ON	-		
P25BA	DeSOx Switch Open/Stuck Fault	ON	-		
P0180	Fuel Temperature Sensor ADC Fault	-	-		
P01C3	Fuel filter pressure sensor OC fault : Not available or Condition exist	FLASH	80%		
P01C4	Fuel filter pressure sensor feedback low fault : Fuel filter or fuel tank strainer check	FLASH	80%		
P0217	Coolant high temperature fault	ON	80%		
P0241	Boost error too low fault	ON	50%		
P0242	Boost error too high fault	ON	50%		
P025B	IMV Drive SC Fault	-	-		
P0400	EGR Air Plausibility fault				
P0421	DOC Exothermal Efficiency Fault	-	-		
P16XX	ECU Safety Monitoring Fault	ON	-		
P2120	Hand Pedal Position Sensor 1 Fault	ON			
P2121	Hand Pedal Performance Fault	ON	50%		
P2125	Hand Pedal Position Sensor 2 Fault	ON			
P2138	Hand Pedal Position Sensor Correlation Fault	ON	50%		
P242B	SCR in temperature sensor plausibility fault	FLASH	80%		
P2463	Service DeSOx Needed Fault	ON	50%		
P2BB1	SCR Inducement Fault - EGR block	-	-		
P2BB2	SCR Inducement Fault - Dosing fault	-	-		
P2BB4	SCR Inducement Fault - UREA(DEF) quality fault	-	-		

Operation Section

DTC	Description	LAMP	TRQ	Limphome Mode	Engine STOP in 5minutes
P2BB5	SCR Inducement Fault - Tampering	1			
P2BB6	SCR Inducement Fault - Repeat offense	1	-		
P2BC1	SCR Inducement Fault - UREA(DEF) tank warning	-	-		
P2BC2	SCR Inducement Fault - UREA(DEF) tank level very low (warning escalation)	-	-		
P2BC3	SCR Inducement Fault	-	-		
P2BC4	SCR Inducement Fault - UREA(DEF) tank level empty	-	-		
P2BD0	SCR Inducement Fault	FLASH	80%		
U0140	J1939 CAN Pedal Fault	FLASH	-		
U0140	Timeout of CM1 (Service DeSOx Switch)	FLASH	-		

DCU Fault List

An inducement is set to limit engine power and speed when the SCR system fails to regularly reduce nitrogen oxides. This is for the operator to stop work and take a measure.

DTC	Description	Inducement
P2530	Key Position Error	-
P0071	Environment Temperature Too High	Interruption of Dosing
P0071	Environment Temperature Too Low	Interruption of Dosing
P0073	Environment Temperature Sensor High	-
P0072	Environment Temperature Sensor Low	-
P1563	Battery Voltage High	-
P1562	Battery Voltage Low	-
P1561	Battery Voltage Error (SCR)	-
U1544	SAE J1939 Error (Reference Torque, ECU)	-
U1401	UDS CAN ID Error	-
U110E	CAN A Bus-off	-
P203B	DEF Level Too High	-
P203B	DEF Level Too Low	-
P203F	DEF Level is Warning	DEF
P203F	DEF Level is Empty	DEF
P203A	DEF Level Signal Error	-
P203E	DEF Fill Level High	-
P203E	DEF Fill Level Low	-
P205B	DEF Temperature Too High	-
P205B	DEF Temperature Too Low	-
P205B	DEF Temperature Plausibility High	-
P205B	DEF Temperature Plausibility Low	-
P205E	DEF Overheating	-
P205A	DEF Temperature Sensor Error	-
P205A	DEF Temperature Signal Error	-
P2202	inlet Nox Sensor Short Circuit	Tampering
P2203	inlet Nox Sensor Open	Tampering
U1216	Inlet NOx Sensor SAE J1939 Error (Concentration)	-
P23C1	inlet Nox O2 Plausibility (Full-Load)	-
P23A3	Inlet NOx Sensor SAE J1939 Error (Binary Lambda Max)	-
P23A5	Inlet NOx Sensor SAE J1939 Error (Binary Lambda Min)	-
U1217	SAE J1939 Error (inlet Nox Sensor)	-
P23C3	O2 Plausibility in overrun (Sensor 1)	-
P23C5	O2 Plausibility in part load (Sensor 1)	-
P23F0	inlet Nox Delay (O2 Signal High)	-

DTC	Description	Inducement
U1223	Inlet NOx Sensor SAE J1939 Error (Power Signal)	-
P23E1	inlet Nox Delay (O2 Signal Low)	-
U1219	Inlet NOx Sensor SAE J1939 Error (Temperature)	-
P23EE	Inlet NOx sensor Wire monitoring	-
P23EF	Outlet NOx sensor Wire monitoring	-
P23D1	inlet Nox Dynamic Error (O2 Signal High)	-
P23D2	outlet Nox Dynamic Error (O2 Signal High)	-
P23D3	inlet Nox Dynamic Error (O2 Signal Low)	-
P23D4	outlet Nox Dynamic Error (O2 Signal Low)	-
P23A7	Inlet NOx sensor SAE J1939 Error (Linear lambda Max)	-
P23A9	Inlet NOx sensor SAE J1939 Error (Linear lambda Min)	-
P23A1	Inlet NOx sensor signal readiness Error	Tampering
P2391	Inlet NOx Sensor offset max error	-
P2393	Inlet NOx Sensor offset min error	-
P2395	Inlet NOx Sensor SRC Max	-
P2397	Inlet NOx Sensor SRC Min	-
U1224	Inlet NOx Sensor SAE J1939 Error (Nox Signal)	-
P239E	Nox Undershoot Error (Sensor 1)	-
U1234	SAE J1939 Error (inlet Nox Sensor Signal)	-
P2215	Outlet Nox Sensor Short Circuit	Tampering
P2216	Outlet Nox Sensor Open	Tampering
U1226	Outlet NOx Sensor SAE J1939 Error (Concentration)	-
P23C2	outlet Nox O2 Plausibility (Full-Load)	-
P23A4	Outlet NOx Sensor SAE J1939 Error (Binary Lambda Max)	-
P23A6	Outlet NOx Sensor SAE J1939 Error (Binary Lambda Min)	-
U1227	Outlet NOx Sensor SAE J1939 Error (Oxidation Factor)	-
P23C4	O2 Plausibility in overrun (Sensor 2)	-
P23C6	O2 Plausibility in part load (Sensor 2)	-
P23F1	outlet Nox Delay (O2 Signal High)	-
U1233	Outlet NOx Sensor SAE J1939 Error (Power Signal)	-
P23E2	outlet Nox Delay (O2 Signal Low)	-
U1229	Outlet NOx Sensor SAE J1939 Error (Temperature)	-
P23A8	Outlet NOx sensor SAE J1939 Error (Linear lambda Max)	-
P23AA	Outlet NOx sensor SAE J1939 Error (Linear lambda Min)	-
P23A2	Outlet NOx sensor signal readiness Error	Tampering
P2392	Outlet NOx Sensor offset max error	-
P2394	Outlet NOx Sensor offset min error	-
P2396	Outlet NOx Sensor SRC Max	-

DTC	Description	Inducement
P2398	Outlet NOx Sensor SRC Min	-
U1225	Outlet NOx Sensor SAE J1939 Error (Nox Signal)	-
P239F	Nox Undershoot Error (Sensor 2)	-
U1235	Outlet NOx Sensor SAE J1939 Error (O2 Signal)	-
P2047	Dosing Valve Short Circuit to Battery	Tampering
P2048	Dosing Valve Short Circuit to Ground	Tampering
P2049	Dosing Valve Short Circuit to Battery	Tampering
P202E	Dosing Valve Over Temperature	Tampering
P2064	Dosing Valve Short Circuit to Ground	-
P208E	Dosing Valve is blocked	-
P202C	DEF Tank Heater SCB	Interruption of Dosing
P202B	DEF Tank Heater SCG	Interruption of Dosing
P202A	DEF Tank Heater Open	Interruption of Dosing
P209F	DEF Tank Heater Over-temperature	Interruption of Dosing
P068A	DCU Main Relay (Early opening)	-
P2510	DCU Main Relay (Stuck)	-
P0659	DCU Actuator Relay 0 SCB	-
P0658	DCU Actuator Relay 0 SCG	-
P2671	DCU Actuator Relay 1 SCB	-
P2670	DCU Actuator Relay 1 SCG	-
P2686	DCU Actuator Relay 2 SCB	-
P2685	DCU Actuator Relay 2 SCG	-
P26E9	DCU Actuator Relay 3 SCB	-
P26E8	DCU Actuator Relay 3 SCG	-
P206B	DEF Quality Error	DEF Quality
P206B	DEF Quality Error	DEF Quality
P206D	DEF Quality Sensor Open	Tampering
P206C	DEF Quality Sensor SCG	Tampering
P206A	DEF Quality Sensor Fail	Tampering
P206A	DEF Quality Sensor Fail	Tampering
P203D	DEF Level Sensor Open	Tampering
P203C	DEF Level Sensor SCG	Tampering
P203A	DEF Level Signal Error	-
P27B3	outlet NOx Peak Plausibility Error	-
P27B4	outlet NOx Stuck Error	-
P20E8	DEF Pump Pressure Too Low	-
P204D	DEF Pump Pressure Max	Tampering
P204C	DEF Pump Pressure Min	Tampering

DTC	Description	Inducement
P204F	DEF Pump Pressure Signal Error	-
P23BB	DEF Pump Pressure Too High	-
P23BA	DEF Pump Pressure Too Low	-
P204E	Defective Pressure Reduction	-
P204D	DEF Pump Pressure Max	Tampering
P204C	DEF Pump Pressure Min	Tampering
P204B	Monitoring of Pressure Build-up	Tampering
P204D	DEF Pump Pressure Max	Tampering
P27F0	Nox Controller Reset Error	-
P20C8	DEF Line Heater SCB	Interruption of Dosing
P20BD	DEF Line Heater 3 SCG or Open	Interruption of Dosing
P20C2	General Backflow Line Plausibility Error	Interruption of Dosing
P20C1	DEF Line Heater 4 SCG or Open	Interruption of Dosing
P20C5	DEF Line Heater 5 SCG or Open	Interruption of Dosing
P21C4	DEF Heater Relay SCB	Interruption of Dosing
P21C3	DEF Heater Relay SCG	Interruption of Dosing
P21C2	DEF Heater Relay Open	Interruption of Dosing
P21C2	DEF Heater Relay Open	Interruption of Dosing
P20BE	Pressure Line Heater Plausibility Error	Interruption of Dosing
P20C0	Pressure Line Heater SCB	Interruption of Dosing
P20BF	Pressure Line Heater SCG	Interruption of Dosing
P20BD	DEF Line Heater 3 SCG or Open	Interruption of Dosing
P20BE	Pressure Line Heater Plausibility Error	Interruption of Dosing
P20BE	Pressure Line Heater Plausibility Error	Interruption of Dosing
P20C2	General Backflow Line Plausibility Error	Tampering
P20C4	Backflow Line Heater SCB	Interruption of Dosing
P20C3	Backflow Line Heater SCG	Interruption of Dosing
P20C1	DEF Line Heater 4 SCG or Open	Interruption of Dosing
P20C2	General Backflow Line Plausibility Error	Interruption of Dosing
P20C6	Suction Line Heater Plausibility Error	Interruption of Dosing
P20C8	DEF Line Heater SCB	Interruption of Dosing
P20C7	Suction Line Heater SCG	Interruption of Dosing
P20C5	DEF Line Heater 5 SCG or Open	Interruption of Dosing
P20C6	Suction Line Heater Plausibility Error	Interruption of Dosing
P0426	SCR Inlet Temperature Error	Interruption of Dosing
P0426	SCR Inlet Temperature Error	Interruption of Dosing
P0428	SCR Inlet Temperature Sensor Signal High	Tampering
P0427	SCR Inlet Temperature Sensor Signal Low	Tampering

DTC	Description	Inducement
P24F6	SCR Inlet Temperature Plausibility Max	-
P24F5	SCR Inlet Temperature Plausibility Min	-
P24F4	SCR Inlet Temperature Static Plausibility	-
P0426	SCR Inlet Temperature Error	Interruption of Dosing
P042B	SCR Outlet Temperature Error	Interruption of Dosing
P042B	SCR Outlet Temperature Error	Interruption of Dosing
P042D	SCR Outlet Temperature Sensor Signal High	-
P042C	SCR Outlet Temperature Sensor Signal Low	-
P24FA	SCR outlet Temperature Static Plausibility	-
P042B	SCR Outlet Temperature Error	Interruption of Dosing
P27B6	inlet Nox Plausibility Max	-
P27B5	inlet Nox Plausibility Min	-
P27B1	Long-term Adaption Factor Max	-
P27B0	Long-term Adaption Factor Min	-
P27C0	Average Efficiency Error (SCR System)	-
P27C1	Average Efficiency Error (SCR System)	-
P27C2	Average Efficiency Error (SCR System)	-
P27C3	Average Efficiency Error (SCR System)	-
P115D	DEF Temperature Sensor Open	Tampering
P115C	DEF Temperature Sensor SCG	Tampering
P115A	DEF Temperature Sensor Fail	Tampering
P2A8D	DEF Pump Motor Speed Duty High	Tampering
P2A8C	DEF Pump Motor Speed Duty Low	Tampering
P208B	DEF Pump Motor Over temperature	-
P201F	DEF Pump Motor Speed Deviation Error (permanent)	Tampering
P208D	DEF Pump Motor SCB	Tampering
P208C	DEF Pump Motor SCG	Tampering
P208A	DEF Pump Motor Open	Tampering
P208B	DEF Pump Motor Over temperature	-
P2B8D	DEF Pump Motor Internal Duty High	Tampering
P2B8C	DEF Pump Motor Internal Duty Low	Tampering
P20FD	DEF Backflow Pump SCB	Tampering
P20FC	DEF Backflow Pump SCG	Tampering
P20FA	DEF Backflow Pump Open	Tampering
P20FB	DEF Backflow Pump Over temperature	Tampering
P2081	DOC Inlet Temperature Error	-
P2081	DOC Inlet Temperature Error	-
P2080	DOC Inlet Temperature Sensor Signal Error	-

DTC	Description	Inducement
P2080	DOC Inlet Temperature Sensor Signal Error	-
U1024	Inlet NOx Sensor SAE J1939 Error (heater ratio)	-
U1025	Inlet NOx Sensor SAE J1939 Error (Nox gain)	-
U1026	Inlet NOx Sensor SAE J1939 Error (Nox offset)	-
U1027	Inlet NOx Sensor SAE J1939 Error (lambda pressure corr.)	-
U1028	Inlet NOx Sensor SAE J1939 Error (Nox pressure corr.)	-
U1029	Inlet NOx Sensor SAE J1939 Error (NO2 correction)	-
U102A	Inlet NOx Sensor SAE J1939 Error (NH3 correction)	-
U102B	Outlet NOx Sensor SAE J1939 Error (heater ratio)	-
U102C	Outlet NOx Sensor SAE J1939 Error (Nox gain)	-
U102D	Outlet NOx Sensor SAE J1939 Error (Nox offset)	-
U102E	Outlet NOx Sensor SAE J1939 error (lambda pressure corr.)	-
U102F	Outlet NOx Sensor SAE J1939 Error (Nox pressure corr.)	-
U1030	Outlet NOx Sensor SAE J1939 Error (NO2 correction)	-
U1031	Outlet NOx Sensor SAE J1939 Error (NH3 correction)	-
P204B	Monitoring of Pressure Build-up	Tampering
P204A	General Pressure Check Error	Tampering
U140F	DEF Pump Motor Communication Fail (Supply Module)	Tampering
P23B2	Supply Module Heater Plausibility Error	-
P25E1	Supply Module Heater Duty High	Tampering
P25E0	Supply Module Heater Duty Low	Tampering
P23B3	Supply Module Heater Temperature Plausibility Error	-
P23B4	Supply Module Heater Temperature cold start Plausibility Error	-
P20BC	Supply Module Heater SCB	Interruption of Dosing
P20BB	Supply Module Heater SCG	-
P20B9	Supply Module Heater Open	Interruption of Dosing
P20BA	Supply Module Heater Over temperature	Interruption of Dosing
P25E3	Supply Module Temperature Duty High	Tampering
P25E2	Supply Module Temperature Duty Low	Tampering
P23B5	Supply Module Temperature Plausibility Error	-
P23B6	Supply Module Temperature cold start Plausibility Error	-
P06EB	Outlet NOx Sensor Self-Diagnosis	-
P06EB	Outlet NOx Sensor Self-Diagnosis	-
P06EB	Outlet NOx Sensor Self-Diagnosis	-
P06EA	Inlet NOx Sensor Self-Diagnosis	-
P06EA	Inlet NOx Sensor Self-Diagnosis	-

DTC	Description	Inducement
P06EA	Inlet NOx Sensor Self-Diagnosis	-
U1904	Timeout of NOxSensGlbReqTx (NOX sensor)	-
U1646	Timeout of DM1ECU BAM (ECU)	-
U1660	Timeout of DM1ECU Packet (ECU)	-
U1444	Timeout of EEC1 (ECU)	-
U111A	Timeout of AT1I1 (Inlet Nox sensor)	-
U116D	Timeout of AT1O1 (Outlet Nox sensor)	-
U1300	Variant Dataset Error	-
P062F	EEPROM Code Word Error	-
U116F	Timeout of AT1OGC2 (Outlet Nox sensor)	-
U116E	Timeout of AT1OGC1 (Outlet Nox sensor)	-
U111C	Timeout of AT1IGC2 (Inlet Nox sensor)	-
U111B	Timeout of AT1IGC1 (Inlet Nox sensor)	-
U1800	Timeout of A1DOC (DOC Inlet Temperature Sensor)	-
U121A	Timeout AT1T1I (DEF Tank)	-
U1916	Timeout of EEC7 (ECU)	-
U1923	Timeout of A1DEFI (DEF Tank)	-
U1126	Timeout of DM1ECU (ECU)	-
U1661	Timeout of DM1ECUSPN1 (ECU)	-
U1147	Timeout of EEC3 (ECU)	-
U1162	Timeout of ET1	-
U1169	Timeout of AMB	-
U1170	Timeout of IC1	-
U1196	Timeout of PROSCR1 (ECU)	-
U1200	Timeout of PROSCR3 (ECU)	-
P23B0	Leakage Detection	-
P23B1	Evaluate Filter Clog	-
P2381	Inlet NOx Sensor Heater Readiness Error	-
P2383	Inlet NOx Sensor Mounting Error	-
P2385	Inlet NOx Sensor Signal Validity Error	-
P237E	Heater No Availability (Sensor 1)	-
P2387	Inlet NOx Sensor Dynamic High Error	-
P2388	Inlet NOx Sensor Dynamic Low Error	-
P2382	Outlet NOx Sensor Heater Readiness Error	-
P2384	Outlet NOx Sensor Mounting Error	-
P2386	Outlet NOx Sensor Signal Validity Error	-
P237F	Heater No Availability (Sensor 2)	-
P160C	DCU Reset 0	-

DTC	Description	Inducement
P160D	DCU Reset 1	-
P160E	DCU Reset 2	-
P160C	DCU Reset 0	-
P160D	DCU Reset 1	-
P160E	DCU Reset 2	-
P160F	Peripheral Monitoring Error	-
P1602	Sensor Supply Error	-
P1220	DEF Temperature Plausibility High	
P1221	DEF Temperature Plausibility Low	
P1223	DEF Temperature Too High	
P1224	DEF Temperature Too Low	
P1227	DEF Temperature Sensor Error	
P1229	DEF Temperature Signal Error	
P1230	DEF Level Signal Error	
P1231	DEF Level Sensor Fail	
P123A	DEF Fill Level High	
P123B	DEF Fill Level Low	
P123C	DEF Level is Warning	
P123D	DEF Level is Empty	
P1332	Dosing Valve Tip Temperature Error at Cold condition	
P1337	Dosing Valve Tip Temperature Error	
P1343	Dosing Valve Short Circuit to Battery	
P1344	Dosing Valve Short Circuit Error	
P1350	DOC Inlet Temperature Too High	
P1351	DOC Inlet Temperature Too Low	
P1353	DOC Inlet Temperature Sensor Signal High	
P1354	DOC Inlet Temperature Sensor Signal Low	
P1360	SCR Inlet Temperature Too High	
P1361	SCR Inlet Temperature Too Low	
P1370	SCR Outlet Temperature Too High	
P1371	SCR Outlet Temperature Too Low	
P1443	DEF Pump Pressure Max	
P1444	DEF Pump Pressure Min	
P1450	Overpressure in Metering Control	
P1451	Underpressure in Metering Control	
P1452	Monitoring of Over Pressure	
P1453	Pressure Stabilization Error	
P1455	Monitoring of Pressure Build-up	

DTC	Description	Inducement
P1511	DEF Quality Sensor Fail	
P1531	DEF Quality Signal Error	
P1560	DEF Quality Too High	
P1630	DCU EEP Read Error	
P1631	DCU EEP Write Error	
P16C0	DCU Reset 0	
P16C1	DCU Monitoring Error (query-/response-communication)	
P16C2	DCU Reset 1	
P16C3	DCU Monitoring Error (SPI communication)	
P16C4	DCU Reset 2	
P16C5	DCU Monitoring Error (ROM-test)	
P1710	Environment Temperature Too High	
P1711	Environment Temperature Too Low	
P1880	DEF Line failure	
P1882	Pressure Line Heater Plausibility Error	
P1884	Pressure Line Heater Over-temperature	
P1885	Pressure Line Heater Open Load	
P1892	Backflow Line Heater SCB	
P1893	General Backflow Line Plausibility Error	
P1894	Backflow Line Heater Over-temperature	
P1895	Backflow Line Heater Open Load	
P18A2	Suction Line Heater Plausibility Error	
P18A3	Suction Line Heater SCB	
P18A4	Suction Line Heater Over-temperature	
P18A5	Suction Line Heater Open Load	
P18B0	DEF Line Heater SCB	
P18B2	DEF Heater Relay Over-temperature	
P18B5	DEF Heater Relay Open Load	
P1A32	Self-Diagnosis in Nox Sensor 2 (Outlet Nox sensor)	
P1A37	Self-Diagnosis abort in Nox Sensor 2 (Outlet Nox sensor)	
P1A39	Nox Sensor 2 timeout to self-Diagnosis ((Outlet Nox sensor)	
P1A42	Self-Diagnosis in Nox Sensor 1 (Inlet Nox Sensor)	
P1A47	Self-Diagnosis abort in Nox Sensor 1 (Inlet Nox Sensor)	
P1A49	Nox Sensor 1 timeout to self-Diagnosis (Inlet Nox Sensor)	
P20EE	SCR Efficiency Monitoring (Nox Sensor)	
P20FF	Dosing Valve Tip Temperature Error	*TRQ3
U0024	SAE J1939 Error (Inlet Nox sensor)	

DTC	Description	Inducement
U0025	SAE J1939 Error (Inlet Nox sensor)	
U0026	SAE J1939 Error (Inlet Nox sensor)	
U0027	SAE J1939 Error (Inlet Nox sensor)	
U0028	SAE J1939 Error (Inlet Nox sensor)	
U0029	SAE J1939 Error (Inlet Nox sensor)	
U002A	SAE J1939 Error (Inlet Nox sensor)	
U002B	SAE J1939 Error (outlet Nox sensor)	
U002C	SAE J1939 Error (outlet Nox sensor)	
U002D	SAE J1939 Error (outlet Nox sensor)	
U002E	SAE J1939 Error (outlet Nox sensor)	
U002F	SAE J1939 Error (outlet Nox sensor)	
U0030	SAE J1939 Error (outlet Nox sensor)	
U0031	SAE J1939 Error (outlet Nox sensor)	
U010E	CAN A Bus-off	
U011A	Timeout of AT1I1 (Inlet Nox sensor)	
U011B	Timeout of AT1IGC1 (Inlet Nox sensor)	
U011C	Timeout of AT1IGC2 (Inlet Nox sensor)	
U0147	Timeout of EEC3 (ECU)	
U0162	Timeout of ET1	
U0169	Timeout of AMB	
U016D	Timeout of AT1O1 (Outlet Nox sensor)	
U016E	Timeout of AT1OGC1 (Outlet Nox sensor)	
U016F	Timeout of AT1OGC2 (Outlet Nox sensor)	
U0170	Timeout of IC1	
U0196	Timeout of PROSCR1 (ECU)	
U0200	Timeout of PROSCR3 (ECU)	
U0216	SAE J1939 Error (inlet Nox sensor)	
U0219	SAE J1939 Error (inlet Nox sensor)	
U021A	Timeout AT1T1I (DEF Tank)	
U0223	SAE J1939 Error (inlet Nox sensor)	
U0224	SAE J1939 Error (inlet Nox sensor)	
U0225	SAE J1939 Error (outlet Nox sensor)	
U0226	SAE J1939 Error (outlet Nox sensor)	
U0227	SAE J1939 Error (outlet Nox sensor)	
U0229	SAE J1939 Error (outlet Nox sensor)	
U0233	SAE J1939 Error (outlet Nox sensor)	
U0235	SAE J1939 Error (outlet Nox sensor)	
U0300	Variant Dataset Error	

DTC	Description	Inducement
U0401	UDS CAN ID Error	
U040F	DEF Pump Motor Communication Fail (Supply Module)	Tampering
U0444	Timeout of EEC1 (ECU)	
U0646	Timeout of DM1ECU BAM (ECU)	
U0660	Timeout of DM1ECU Packet (ECU)	
U0661	Timeout of DM1ECUSPN1 (ECU)	
U0800	Timeout of A1DOC (DOC Inlet Temperature Sensor)	
U0904	Timeout of NOxSensGlbReqTx (NOX sensor)	
U0916	Timeout of EEC7 (ECU)	
U0923	Timeout of A1DEFI (DEF Tank)	

Display of Detecting Control Failure

As shown in the table below, for your information, we provide correlation between Engine fault warning strategy and LCD display.

		Warning S	trategy		LC	D Display
\A/i	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit	Method	Message on the Display
Warning Stage	뼬				F1)-F1
Normal	Off	Off	0%	NA	NA	NA
Level1	On	On	Reduced	Reduced	Continuous	ENGINE MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power Reduced!
Level2	Blinking	On	Limp home	Limp home	Continuous	ENGINE MALFUNCTION CALL DOOSAN SERVICE AGENT Engine is in Limp home Mode
Level3	Blinking	On	Engine Stop	Engine Stop	Continuous	FATAL ENGINE ERROR CALL DOOSAN SERVICE AGENT Engine Stop after 5min

DEF/Ad-Blue Level inducement for USA / Europe

There are several DEF/Ad-Blue level points at which the DEF level indicator lamp changes and the display shows a message to warn the shortage of DEF/Ad-Blue. The lower the point, the more the system limits the engine power and speed in order to prevent nitrogen oxide emissions from exceeding the acceptable level due to a lack of DEF/Ad-Blue. As shown in the table below, for your information, we provide correlation of DEF/Ad-Blue level inducement strategy and LCD display.

DEF/Ad-Blue Level Inducement for USA

		ondition DEF Offence (within 40hrs)		Inducement Strategy						
Inducement	Condition DEF		DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit		
Stage			Я	43						
Normal	25 ~ 100	NA	Green ON	Off	Off	Off	0%	NA		
Level1	10 ~ 25	NA	Green ON	Off	Off	Off	0%	NA		
Level2	5~10	NA	Yellow ON	Off	Off	At starting & Every 20min	25%	NA		
Level3	2.5~5	NA	Red ON	Off	Off	Every 10min	50%	60% (about 1500rpm)		
Level4	0~2.5%	NA	Red Blink	Off	Off	Every 5min	0%	Fix at Low Idle RPM		

			LCD Display			
		Repeat	Method	Message on the Display		
Inducement Stage	Condition DEF volume [%]	Offence (within 40hrs)	#### F1	F1		
Normal	25 ~ 100	NA	NA	NA		
Level1	10 ~ 25	NA	For 1min At starting & Every 20min	DEF LEVEL LOW - REFILL Engine Power will be Reduced		
Level2	5~10	NA	For 1min At starting & Every 20min	DEF LEVEL VERY LOW - REFILL NOW Engine Power Reduced By 25%		
Level3	2.5~5	NA	For 1min Every 10min	DEF LEVEL VERY LOW - REFILL NOW Engine Power Reduced By 50%		
Level4	0~2.5%	NA	Continuous	DEF EMPTY Engine can run LOW IDLE ONLY		

DEF/Ad-Blue Level Inducement for Europe

			Inducement Strategy						
Inducement	Condition DEF	Repeat Offence (within 40hrs)	DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit	
Stage	volume [%]		%	49					
Normal	25 ~ 100	NA	Green ON	Off	Off	Off	0%	NA	
Level1	10 ~ 25	NA	Green ON	Off	Off	Off	0%	NA	
Level2	5~10	NA	Yellow ON	Off	Off	At starting & Every 20min	25%	NA	
Level3	0~5	NA	Red Blink	Off	Off	Every 10min	50%	60% (about 1500rpm)	

			LCD Display			
		Repeat	Method	Message on the Display		
Inducement Stage	Condition DEF volume [%]	Offence (within 40hrs)	F1	F1		
Normal	25 ~ 100	NA	NA	NA		
	10 ~ 25	NA		DEF LEVEL LOW - REFILL		
Level1			For 1min At starting & Every 20min	Engine Power will be		
				Reduced		
Level2	5~10	NA	For 1min Every 10min	DEF LEVEL VERY LOW - REFILL NOW Engine Power Reduced By 25%		
Level3	2.5~5	NA	Continuous	DEF LEVEL VERY LOW - REFILL NOW Engine Power Reduced By 50%		

DEF/Ad-Blue Quality Failure for USA / Europe

If you use a poor quality DEF/Ad-Blue type, engine power will decrease in order to prevent the SCR system from functional degradation and damage. Continued use of poor quality DEF/Ad-Blue may result in high replacement cost due to damage caused to the SCR system.

As shown in the table below, for your information, we provide correlation of DEF/Ad-Blue quality inducement strategy and LCD display.

DEF/Ad-Blue Quality Failure for USA

		Condition Repeat Offence (within 40hrs)	Inducement Strategy						
Inducement	Candition		DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit	
Stage	Condition		M	139	6	9			
Normal	NA	NA	Green ON	Off	Off	Off	0%	NA	
Level1	Poor DEF quality was detected	NA	Green ON	On	Off	Off	0%	NA	
Level2	0.5~2.5hrs	Immediat ely	Green ON	On	Off	At starting & Every 20min	25%	NA	
Level3	2.5~3.5hrs	9~25min	Green ON	Blinking	On	Every 10min	50%	60% (about 1500rpm)	
Level4	over 3.5hrs	over 25min	Green ON	Blinking	Blinking	Every 5min	0%	Fix at Low Idle RPM	

			LCD Display			
		Repeat	Method	Message on the Display		
Inducement Stage	Condition	Offence (within 40hrs)	F1	F1		
Normal	25 ~ 100	NA	NA	NA		
Level1	10 ~ 25	NA	For 1min At starting & Every 20min	DEF QUALITY POOR - CHANGE NOW Engine Power will be Reduced in 30min		
Level2	5~10	NA	For 1min At starting & Every 20min	DEF QUALITY POOR - CHANGE NOW Engine Power Reduced By 25%		
Level3	2.5~5	NA	For 1min Every 10min	DEF QUALITY POOR - CHANGE NOW Engine Power Reduced By 50%		
Level4	0~2.5%	NA	Continuous	DEF QUALITY POOR - CHANGE NOW Engine can run LOW IDLE ONLY		

DEF/Ad-Blue Quality Failure for Europe

		Repeat Offence (within 40hrs)	Inducement Strategy						
Inducement	Condition		DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit	
Stage	Condition		%	જ					
Normal	NA		Green ON	Off	Off	Off	0%	NA	
Level1	Poor DEF quality was detected	≥ 90% of counter value	Green ON	On	Off	Off	0%	NA	
Level2	10~20hrs	for severe induce ment	Green ON	On	On	At starting & Every 20min	25%	NA	
Level3	over 20hrs	(20hr)	Green ON	Blinking	Blinking	Every 10min	50%	60% (about 1500rpm)	

			LCD D	isplay
		Repeat	Method	Message on the Display
Inducement Stage	Condition	Offence (within 40hrs)	F1	F1
Normal	NA		NA	NA
Level1	Poor DEF quality was detected	≥ 90% of counter	For 1min At starting & Every 20min	DEF QUALITY POOR - CHANGE NOW Engine Power will be Reduced
Level2	10~20hrs	value for severe inducement (20hr)	For 1min At starting & Every 10min	DEF QUALITY POOR - CHANGE NOW Engine Power Reduced By 25%
Level3	over 20hrs		Continuous	DEF QUALITY POOR - CHANGE NOW Engine Power Reduced By 50%

SCR system tampering for USA / Europe

There are several tampering level points at which the DEF indicator lamp lights up or blinks and the display shows a message to warn that the DEF/Ad-Blue is not being consumed due to the malfunctioning of the SCR system, the installation of another device to the system, or the handling of related parts. The lower the point, the more the system limits the engine power and speed. As shown in the table below, for your information, we provide correlation of SCR tampering inducement strategy and LCD display.

SCR system Tampering for USA

			Inducement Strategy					
Inducement	Condition	Repeat Offence	DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
Stage	Condition	(within 40hrs)	M	*	뤨			
Normal	NA	NA	Green ON	Off	Off	Off	0%	NA
Level1	Tampering was detected	NA	Green ON	On	Off	Off	0%	NA
Level2	0.5~2.5hrs	Immediat ely	Green ON	On	On	At starting & Every 20min	25%	NA
Level3	2.5~3.5hrs	9~25min	Green ON	Blinking	On	Every 10min	50%	60% (about 1500rpm)
Level4	over 3.5hrs	over 25min	Green ON	Blinking	Blinking	Every 5min	0%	Fix at Low Idle RPM

			LO	CD Display
		Repeat	Method	Message on the Display
Inducement Stage	Stage Condition	Offence (within 40hrs))=F1	= F1
Normal	NA	NA	NA	NA
Level1	Tampering was detected	NA	At starting & Every 20min	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power Reduced in 30min
Level2	0.5~2.5hrs	Immediately	At starting & Every 20min	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power is Reduced By 25%
Level3	2.5~3.5hrs	9~25min	Every 10min	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power is Reduced By 50%
Level4	over 3.5hrs	over 25min	Continuous	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine can run LOW IDLE ONLY

SCR system Tampering for Europe

			Inducement Strategy					
Inducement	Condition	Repeat Offence	DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
Stage	tage (v	(within 40hrs)	%	જ				
Normal	NA		Green ON	Off	Off	Off	0%	NA
Level1	Tamperin g was detected	≥ 95% of counter value	Green ON	On	Off	Off	0%	NA
Level2	36~100hr s	for severe induce	Green ON	On	On	At starting & Every 20min	25%	NA
Level3	over 100hrs	ment (100hrs)	Green ON	Blinking	Blinking	Every 10min	50%	60% (about 1500rpm)

			L	CD Display
		Repeat	Method	Message on the Display
Inducement Stage Condition	Offence (within 40hrs)	F1	F1	
Normal	NA		NA	NA
Level1	Tampering was detected	≥ 95% of counter	At starting & Every 20min	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power will be Reduced
Level2	36~100hrs	value for severe inducement (100hrs)	Every 10min	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power is Reduced By 25%
Level3	over 100hrs		Continuous	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power is Reduced By 50%

Impeded EGR / Interruption of Dosing for Europe only

There are several interruption level points at which the DEF indicator and engine check lamps light up or blink and the display shows a message to warn that the DEF/Ad-Blue is not being consumed due to a fault on the engine EGR valve and SCR system. The lower the point, the more the system limits the engine power and speed. As shown in the table below, for your information, we provide correlation of Impeded EGR / Interruption of Dosing inducement strategy and LCD display.

Impeded EGR for Europe

			Inducement Strategy					
Inducement	Condition	Repeat Offence	DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
Stage	(within 40hrs)	%	જ					
Normal	NA		Green ON	Off	Off	Off	0%	NA
Level1	Impeded EGR detected	≥ 95% of counter value	Green ON	On	Off	Off	0%	NA
Level2	36~100hr s	for severe induce	Green ON	On	On	At starting & Every 20min	25%	NA
Level3	over 100hrs	ment (100hrs)	Green ON	Blinking	Blinking	Every 10min	50%	60% (about 1500rpm)

			Lo	CD Display
		Repeat	Method	Message on the Display
Inducement Condition	Offence (within 40hrs)	F1	F1	
Normal	NA		NA	NA
Level1	Impeded EGR detected	≥ 95% of counter	At starting & Every 20min	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power will be Reduced
Level2	36~100hrs	value for severe inducement (100hrs)	Every 10min	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power is Reduced By 25%
Level3	over 100hrs	. ,	Continuous	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power is Reduced By 50%

Interruption of Dosing for Europe

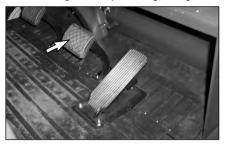
			Inducement Strategy						
Inducement	Condition	Repeat Offence	DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit	
Stage	Stage (v	(within 40hrs)	%	જ					
Normal	NA		Green ON	Off	Off	Off	0%	NA	
Level1	Dosing Interruptio n detected	≥ 90% of counter value	Green ON	On	Off	Off	0%	NA	
Level2	10~20hrs	for severe induce	Green ON	On	On	At starting & Every 20min	25%	NA	
Level3	over 20hrs	ment (20hrs)	Green ON	Blinking	Blinking	Every 10min	50%	60% (about 1500rpm)	

			L	CD Display
		Repeat	Method	Message on the Display
Inducement Stage Condition	Offence (within 40hrs)	F1	F1	
Normal	NA		NA	NA
Level1	Dosing Interruption detected	≥ 90% of counter	At starting & Every 20min	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power will be Reduced
Level2	10~20hrs	value for severe inducement (20hrs)	Every 10min	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power is Reduced By 25%
Level3	over 20hrs		Continuous	SCR SYSTEM MALFUNCTION CALL DOOSAN SERVICE AGENT Engine Power is Reduced By 50%

Lift Truck Operation

Power Shift Transaxle

1. Start the engine. See topic "Starting the Engine."



- Push down on the service brake pedal to hold the lift truck until ready to move it.
- 3. Release the parking brake.

NOTE: The parking brake must be released before the directional control can be used.



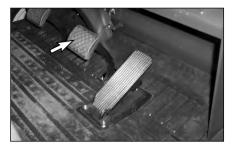
 Select the direction of travel by pushing the directional lever FORWARD for forward direction or by pulling the lever BACK for reverse direction.

▲ WARNING

A lift truck with the engine running but without an operator can move slowly (creep) if the transmission is engaged.

This could result in personal injury.

Always place the transmission control lever in the NEUTRAL (center) position and apply the parking brake before dismounting the lift truck.



- 5. Release the service brake.
- Push down on the accelerator pedal to obtain the desired travel speed. Release the pedal to decrease travel speed.

▲ WARNING

Sudden reversal of a loaded lift truck traveling forward can cause the load to fall or the lift truck to tip.

Stop the loaded lift truck completely, before shifting to reverse.

Failure to comply could result in personal injury.

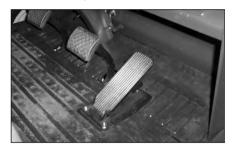
NOTE: Where conditions permit, directional changes can be made under full power at speeds up to 6 km/h (3.73mph). A speed of 6 km/h (3.73mph) is a fast walk. Directional shift changes at speeds above 6 km/h (3.73mph) are considered abusive.

Bring the lift truck to a complete stop where load stability or other factors prevent safe operation under full power shifts

- To change the lift truck direction of travel, release the accelerator pedal.
- **8.** Push down on the service brake pedal to reduce the lift truck speed as necessary.



- Move the directional lever to the desired direction of travel. Slowly push down on the accelerator pedal as the lift truck changes direction.
- When the direction change is completed, continue to push down on the accelerator pedal to obtain the desired travel speed.



- **11.** To stop the lift truck when traveling in either direction, release the accelerator pedal.
- **12.** Push down on the service brake pedal and bring the lift truck to a smooth stop.

Inching

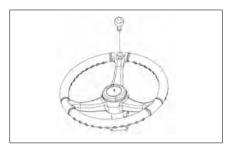
NOTE: The purpose of the inching pedal is to provide precise lift truck inching control at very slow travel speed and high engine rpm. This is used for fast hydraulic lift, during load approach, pick up or load positioning.



- To inch (creep) in either direction, slowly push down on the inching pedal. This will start to apply the service brakes and allow the transmission clutch discs to slip.
- Vary the position of the inching pedal and the accelerator pedal to control the inching speed and distance.
- Pushing down further on the inching pedal will disengage the transmission completely and apply the service brakes fully to stop and hold the lift truck. This will provide full engine power for fast hydraulic lift.
- 4. Avoid overuse of the inching pedal as this may cause the automatic transmission oil to overheat or the clutch to slip. Do not use as a footrest or for long periods of time.
- 5. If user operates continuously pushing work or both brake pedal and accelerator pedal were depressed at the same time, it may cause the automatic transmission oil to overheat or the clutch to slip.

Steering Knob (If Equipped)

There is a steering knob available for inclusion with new truck deliveries. This option is solely intended for slow travel situations when two handed steering is not possible due to hydraulic operations.



WARNING

Loss of stability can occur when a lift truck steering wheel is rotated quickly while the truck is in motion. A steering knob will assist with easy rotation of the steering wheel, but if a steering knob is improperly used (e.g., rotating the steering wheel quickly while the truck is in motion), this can contribute to truck instability and a tip over. A steering knob is intended for slow travel maneuverability ONLY.

Mono-Ped Control System (Option)





Forward-Push the left side (2) of the pedal for FORWARD direction travel.



Neutral-The lift truck should not move when the Mono-Ped pedal is released.



Reverse-Push the right side (1) of the pedal for REVERSE direction travel.

The MONO-PED pedal controls the speed and direction of the lift truck. Pushing on the right side of the pedal (1) causes the lift truck to move in REVERSE. The optional reverse lights and optional back-up alarm will be ON in the REVERSE position. Pushing on the left side of the pedal (2) causes the lift truck to move in FORWARD.

The speed of the truck increases as the pedal is depressed

Auto Shift Controller ASC - 205 (If Equipped)

Product Description

The Auto shift controller is an electrical control system, specially designed for use on forklift trucks with internal combustion engines.

Its primary purpose is to prevent the operator from operating the truck outside of the design parameters, e.g. selecting the reverse gear when traveling in excess of 5.1 km/h (3.17mph) in a forward direction, and vice versa.

The Autoshift controller is mounted on a convenient position away from excessive heat sources and retrofits into the truck's electrical system. An inductive speed sensor is mounted on the transmission case where it will pick up a pulse from a gear tooth pattern. This pulse is used to monitor the truck in motion and its travel speed. To enable the system to change gears smoothly, the shift points for offset speed are adjustable.

The operator no longer has to change gears with his hands, therefore he can be more productive.

The Autoshift controller prevents strain and abuse to the transmission by changing gears up and down automatically. It also prevents damage to the half shaft, excessive tire wear and heat to the transmission.

Features

- 1.2 speed auto shift control
- 2. Prevent downshifting at high speed
- 3. Inhibit selecting direction at high speed outside of the design parameters.



Adjustments

,.	SW1	SW2		
	-High Shift Point)	(Direction Inhibit Point)		
NOTCH	Vehicle Speed	NOTCH	Vehicle Speed	
0	2.5 km/h (1.55 mph)	0	3.3 km/h (2.05 mph)	
1	3.0 km/h (1.86 mph)	1	3.6 km/h (2.24 mph)	
2	3.5 km/h (2.17 mph)	2	3.9 km/h (2.42 mph)	
3	4.0 km/h (2.49 mph)	3	4.2 km/h (2.61 mph)	
4	4.5 km/h (2.80 mph)	4	4.5 km/h (2.80 mph)	
5	5.0 km/h (3.11 mph)	5	4.8 km/h (2.98 mph)	
6	5.5 km/h (3.42 mph)	6	5.1 km/h (3.17 mph)	
7	6.0 km/h (3.73 mph)	7	5.4 km/h (3.36 mph)	
8	6.5 km/h (4.04 mph)	8	5.7 km/h (3.54 mph)	
9	7.0 km/h (4.35 mph)	9	6.0 km/h (3.73 mph)	



Adjustment Switch

Low-High Shift Point (SW1)

ASC-205 allows you to set the 2 speed Auto Gear Shift Point, the maximum travel speed at which the Auto Shift Controller up-shift or down-shift the transmission automatically according to the vehicle speed. For adjustment of 2 speed Auto Gear Shift speed, the SW1 switch is used on the printed circuit board.

For example if SW1 put to 5_n notch, the 2 Speed Auto Gear Shift speed will be 5.0 km/h(3.11 mph), which is factory setting value as a default.

Direction Inhibition Point (SW2)

Auto Shift allows you to set the Direction Inhibition Speed, the maximum travel speed at which the transmission can be reversed. For adjustment of direction inhibit speed, the SW2 switch is used on the printed circuit board.

For example SW2 is put to $7_{\rm sd}$ notch, the Direction Inhibition Speed will be 5.4 km/h (3.36 mph), which is factory setting value as a default.

Diagnostics Features



ASC-205 has internal indicator on the right side of the controller for displaying the selected gear and the abnormal condition.

▲ WARNING

Do not diagnose or repair Auto Shift Controller Faults unless trained and authorized to do so. Improper performance of maintenance procedures is dangerous and could result in personal injury or death.

Below is a description applicable for many ASC-500 implementations.

Display for Operator

Display	Description	Remark
Α	Automatic operation	
Н	High speed	At 2nd shift gear
L	Low speed	At 1st shift gear
Р	T/M Speed sensor open	Flashing
E	E/G Speed sensor open	Flashing
F	Controller fault	Flashing
_	FWD 2 Sol. Short	-
5	or REV 2 Sol. Short	Flashing
6	FWD 1 Sol. Short	Flashing
7	REV 1 Sol. Short	Flashing

This information is given during normal operating when something special happens.

For example, on ASC-500's with the speed sensor, one of the indicators is used to indicate a sensor problem.

Display for Troubleshooting

Display	Description	Remark
Α	Automatic operation	
2	High speed s/w input	Lever input test
3	Forward s/w input	Lever input test
4	Reverse s/w input	Lever input test

This information is input for signal diagnostics.

This test is used to verify operation of direction control lever

Operation

This system can be basically operated in two preselected modes, automatic mode and manual mode.

- Automatic Mode is selected in factory-setting controller as a default.
- Manual Mode (Fail-Safe Mode) is selected to operate the truck manually in case of emergency.

Automatic mode

Direction Inhibition

- Start the engine with the direction control lever in NEUTRAL and the parking brake engaged.
- Press down on the service brake pedal, disengage the parking brake and move the direction control lever to FORWARD.

NOTE: Release the parking brake before using the directional control lever.

- Observe the LED on the Auto Shift Controller. The LED should indicate "A" while the direction control lever is in FORWARD, NEUTRAL and REVERSE. The Auto Shift will be reported as faulty if the LED indicates anything other than "A".
- Keep the service brake pushed down until ready to move the truck.
- 5. To change directions of a traveling lift truck when the Auto Shift Controller LED displays "A", shift the direction control lever to the opposite direction and wait for the lift truck to change direction.
- 6. If, however, your travel speed is higher than the preselected direction change speed as direction inhibition point in the controller, Auto Shift will shift the transmission to NEUTRAL until the lift truck's travel speed slows to the pre-selected direction change speed, and then shift the transmission to the direction selected.
- You should be prepared to help slow the lift truck to the pre-selected direction change speed by pressing down on the service brake pedal.

▲ WARNING

When you want to change the travel direction, you must press down the service brake pedal to reduce the travel speed. Be cautious that the lift truck's stopping distance may be longer than in manual mode because the lift truck continues to travel forward regardless of the selection of reverse with the direction control lever until the vehicle speed is sufficiently reduced.

The direction of travel will change automatically when the vehicle speed is reduced as much as the pre-selected speed in the controller.

▲ WARNING

Make sure the loaded lift truck stops completely before changing travel direction.

Changing travel direction while traveling may cause the lift truck to lose the load or tip over.

When the direction change is completed, continue to push down the accelerator pedal to obtain the desired travel speed.

NOTICE

The transmission of your lift truck may be reversed under full power up to a travel of 6.0 km/h (3.73 mph). But the Inhibition Speed of Auto Shift is set by the factory at 5.4 km/h (3.36 mph) because reversing the transmission at lower travel speeds prolongs the lift of the transmission, axle shafts and tires.

Two-Speed Auto Shift Control

While traveling forward with the high speed gear, that is, 2π gear selected, the ASC-205 can up-shift or downshift the transmission automatically according to the vehicle speed by its own speed ratio control so that the appropriate gear may be engaged in every situation.

NOTICE

Two-Speed Auto Shift Control function is available only when the direction control lever is placed in the high speed (2ω gear) position.

Manual Mode (Fail-Safe mode)

In case that the controller is broken down or you don't want to use the functions of the Auto Shift Controller, you can select Manual Mode. In Manual Mode, you can operate your lift truck in the same manner as any lift truck without Auto Shift Controller. You can select the Manual mode or the Automatic mode by doing following procedures.

⚠ WARNING

In the manual mode, direction inhibition function can not be operated normally. The sudden reversal of a loaded lift truck traveling forward can cause the load to fall or the lift truck to tip over.

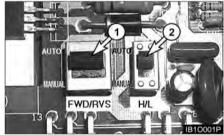
The operator can operate the truck manually by selecting the Manual mode with the Fail-Safe mode switches on the PCB (Printed Circuit Board).

With the switch (1) in "MANUAL" position, direction inhibition function is disable.

If an operator moves the switch (2) from "AUTO" position to "MANUAL" position, then 2-speed auto shift function will become disabled.

Move the switches as indicated, up for Automatic (AUTO) operation or down for Manual (MANUAL) operation.

NOTE: In the factory-setting controller, AUTO mode is selected as a default on the PCB (Printed Circuit Board) as shown below.

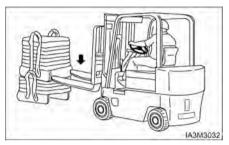


Fail-Safe mode

NOTE: After operating the truck manually by selecting the Manual Mode switch on PCB(Printed Circuit Board), the position of mode must be checked before operating the truck automatically.

Operating Techniques

Inching into Loads



Typical Example

 Move the lift truck slowly FORWARD into position and engage the load. The lift truck should be square with load, forks spaced evenly between pallet stringers and as far apart as load permits.



Typical Example

2. Move the lift truck FORWARD until the load touches the carriage.

Lifting the Load

 Lift the load carefully and tilt the mast back a short distance.



Typical Example

2. Tilt the mast further back to cradle the load.



Typical Example

- Operate the lift truck in reverse until the load is clear of the other material.
- 4. Lower the cradled load to the travel position.

NOTE: Lift and tilt speeds are controlled by engine rpm.

Traveling With the Load

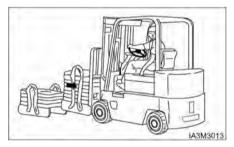
NOTICE

Travel with the load as low as possible, while still maintaining ground clearance.



Typical Example

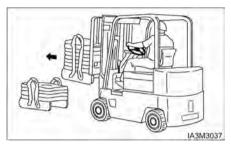
 Travel with the load uphill on upgrades and downgrades.



Typical Example

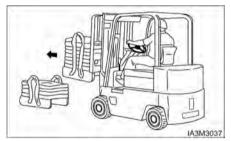
2. For better vision, travel in reverse with bulky loads.

Unloading



Typical Example

1. Move the lift truck into the unloading position.

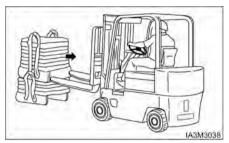


Typical Example

Tilt the mast FORWARD only when directly over the unloading area.

WARNING

Do not tilt the mast forward with the load unless directly over the unloading area, even if the power is off.



Typical Example

3. Deposit the load and BACK away carefully to disengage the forks.



Typical Example

Lower the carriage and forks to the travel position or to the park position.

Turning

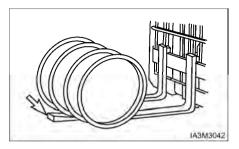


 When turning sharp corners, keep close to the inside corner. Begin the turn when the inside drive wheel meets the corner.

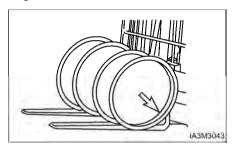


In narrow aisles, keep away from the stockpile when turning into the aisle. Allow for counterweight swing.

Lifting Drums or Round Objects



 Block drums or round objects. Tilt the mast FORWARD and slide the fork tips along the floor to get under the load.



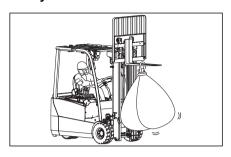
2. Before lifting, tilt the mast BACK slightly until the load is cradled on the forks.

Operating in hot weather

Keep the following points in mind when you operate the lift truck in hot weather.

- Check the radiator. Clogging can cause overheating. Clean them out regularly with a blast of compressed air, also, check for leakage of water.
- Check the fan belt tension and adjust to proper tension.
- Even if the engine overheats and the coolant boils over, let the engine idle for a while with opening engine hood until temperature falls before shutting off the engine.

Safety instructions for attachments when transporting suspended loads



▲ WARNING

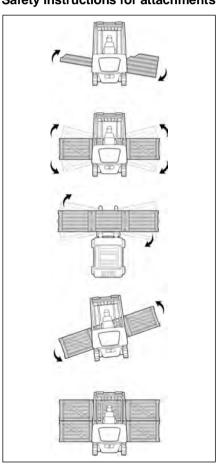
Swinging loads and a reduced residual capacity can result in accidents

Adapt the travel speed to the load, less than walking pace.

Secure swinging loads for example with lifting slings.

Reduce the residual capacity and have it certified by a expert.

Safety instructions for attachments when transporting wide loads



Load lateral center of gravity

Where it is necessary to lift a wide load where the lateral load center of gravity is unknown. Do a test lift first to determine lateral center of gravity and potential movement with the load during transport. Exercise extra caution when handling offcenter loads that cannot be centered.

Load Stability

Be careful when stopping or changing direction suddenly, lifting or lowering suddenly as wide loads could become unstable

Load Swing

Be careful whilst travelling or turning, the load ends will swing wide. Make sure you have adequate clearance, and watch out for people in the area.

Load Shift

Be careful when turning, turn slowly to prevent load from shifting.

Visibility

When carrying a bulky load which blocks or restricts forward visibility the truck shall be driven with the load trailing and if necessary under the direction of a person who has visibility in the direction of travel, unless safe work practises allow otherwise.

Parking the Lift Truck

Park the lift truck on level ground, lowering the forks and tilting the mast forward until the fork tips touch the floor. Block the drive wheels when parking on an incline.



1. Park in an authorized area only. Do not block traffic



- 2. Place the transmission controls in NEUTRAL.
- 3. Engage the parking brake.
- 4. Lower the forks to the ground.

▲ WARNING

Blocking the wheels will prevent unexpected lift truck movement, which could cause personal injury.



- Turn the key in the ignition switch to the OFF position and remove the key.
- Actuate each loading lever several times to remove the residual pressure in the respective cylinders and hoses.
- 7. Block the drive wheels if parking on an incline.

Lift Fork Adjustment

↑ WARNING

When adjusting the fork spread, be careful not to pinch your hand between forks and the carriage slot.

Hook - on type Fork



- 1. Move up the hook pin to the free position.
- 2. Raise the hook pin in each fork to side the fork on the carriage bar.
- Adjust the forks in the position most appropriate for the load and as wide as possible for load stability.
- When adjusting the forks, make sure that the weight of the load is centered on the truck.
- After adjustment, set the fork locks to keep the forks in place.

WARNING

Make sure the forks are locked before carrying a load.

If the fork/locking pin is not fully engaged, the fork could become unintentionally disengaged.

Storage Information

Before Storage

Before storing your lift truck, clean and inspect as the following procedures.

- Wipe away grease, oil, etc. adhering to the body of the truck with waste cloth, and use water, if needed.
- While cleaning the truck, check general condition of the truck. Especially check the truck body for dents or damage and tires for wear or nails or stones in the tread.
- Fill the fuel tank with fuel specified.
- Check for leakage of hydraulic oil, engine oil, fuel, or coolant, etc.
- Apply grease, where needed.
- Check for looseness of nuts and bolts, especially hub nuts.
- Check mast rollers to see that they rotate smoothly.
- Prime the oil into the lift cylinders by actuating the lift lever all the way several times.
- Drain off coolant completely in cold weather, if antifreeze is not used.
- Drain off DEF/Ad-Blue completely for long term storage. (If not the purity of DEF/Ad-Blue would be changed to lower quality.)

Long Time Storage

Perform the following service and checks in addition to the "Parking the lift truck" services.

- Taking the rainy season into consideration, park the machine at a higher and hard ground.
- Avoid parking on soft grounds such as asphalt ground in summer.
- Dismount the battery from the machine. Even though the machine is parked indoors, if the place is hot or humid, the battery should be kept in a dry, cool place. Charge the battery once a month.
- Apply antirust to the exposed parts which tend to rust.
- Cover components such as the breather and air cleaner which may be caught with humidity.
- The machine should be operated at least once a week. Fill the cooling system, if cooling water is discharged, and mount the battery. Start the engine and warm up thoroughly. Move the machine a little forwards and backwards. Operate the hydraulic controls several times.

To Operate the Lift Truck After a Long Time Storage

- Remove covers and antirust from each of the components and exposed parts.
- Drain the engine crankcase, transmission (dutch type machine), differential and final reduction gear, clean the inside of them and add new oil.
- Drain off foreign matter and water from the hydraulic oil tank and fuel tank.
- Remove the head cover from the engine cylinder.
 Oil valves and rocker shaft and check each valve for proper operation.
- Add cooling water to the specified level.
- Charge the battery and mount it on the machine.
 Connect the cables.
- Perform pre-operational checks carefully. (refer to "Before Starting the Engine")
- Warm up the machine.
- If deteriorated DEF/Ad-Blue warning lamp turns on and message appears, drain the fluid in the DEF/Ad-Blue tank thoroughly and refill with new DEF/Ad-Blue.
- Check level of DEF/Ad-Blue and if necessary refill DEF/Ad-Blue (refer page.72)

Transportation Hints

Lift Truck Shipping

Check travel route for overpass clearances. Make sure there is adequate clearance if the lift truck being transported is equipped with a high mast, overhead quard or cab.

To prevent the lift truck from slipping while loading, or shifting in transit, remove ice, snow or other slippery material from the loading dock and the truck bed before loading.

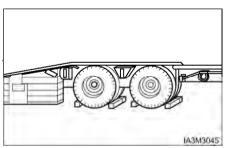
NOTICE

Obey all state and local laws governing the height, weight, width and length of a load.

Observe all regulations governing wide loads.

NOTICE

Remove ice, snow or other slippery material from the shipping vehicle and the loading dock.



Always block the trailer or the rail car wheels before loading the lift truck.

Position the lift truck on the truck bed or the rail car.

Apply the parking brake and place the transmission control in NEUTRAL.

Turn the ignition switch to the OFF position and remove the key.

Block the wheels and secure the lift truck with tiedowns.

Machine Lifting and Tiedown Information

NOTICE

Improper lifting or tiedowns can allow load to shift and cause injury and/or damage.

 Weight and instructions given herein apply to lift trucks as manufactured by DOOSAN.

Use proper rated cables and slings for lifting. Position the crane for level lift truck lift.

Spreader bar widths should be sufficient to prevent contact with the lift truck.

Use the tiedown locations provided for lift truck tiedown

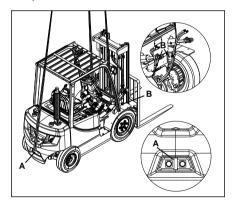
Check the state and local laws governing weight, width and length of a load.

Contact your DOOSAN Lift Truck dealer for shipping instructions for your lift truck.

Lifting a Forklift using a Crane

▲ WARNING

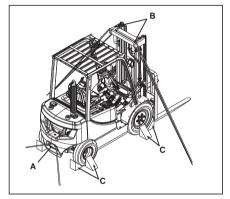
- If lifting rope breaks, serious injury/damage may occur.
- The lifting wire rope and stay must be long enough to avoid contact with the forklift. Short rope/stay can damage the vehicle. If it's too long, it may cause interference.
- Rope/chain and other lifting tools must have sufficient strength, and free of any defect or wear.
- 4. Avoid impact load to the lifting devices/tools.
- Check the weight, length, width and height of the vehicle before lifting.
- 2. Park the crane at an appropriate position.
- 3. Connect the rope/chain to the points A and B of the figure below.
- 4. If the wire rope/chain contacts the vehicle, insert a rubber plate between the rope/chain and the vehicle to protect the vehicle.

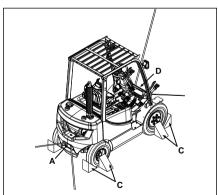


5. Lift up the vehicle slowly.

How to Fix Forklift to a Carrier

- 1. The rope/chain must have sufficient length for fixing.
- 2. Park the vehicle on a level ground.
- 3. Set the mast vertically. Lower the fork or attachment to the lowest position.
- **4.** Set all the operating devices to Neutral Position. Turn OFF the start switch.
- 5. Apply the parking brake. Stop the tires with blocks (C).
- 6. Connect towing hooks to the mast top B (if without mast, front drive axle fix frame or front fender bottom fixing hole D) and rear tow pin A, as shown in the figure below.





Towing Information

⚠ WARNING

Personal injury or death could result when towing a disabled lift truck incorrectly.

Block the lift truck wheels to prevent movement before releasing the brakes. The lift truck can roll free if it is not blocked.

Follow the recommendations below, to properly perform the towing procedure.

These towing instructions are for moving a disabled lift truck a short distance, at low speed, no faster than 2 km/h (1.2 mph), to a convenient location for repair. These instructions are for emergencies only. Always haul the lift truck if long distance moving is required.

Shield must be provided on the towing lift truck to protect the operator if the tow line or bar should break.

Do not allow riders on the lift truck being towed unless the operator can control the steering and/or braking.

Before towing, make sure the tow line or bar is in good condition and has enough strength for the towing situation involved. Use a towing line or bar with a strength of at least 1.5 times the gross weight of the towing lift truck for a disabled lift truck stuck in the mud or when towing on a grade.

Keep the tow line angle to a minimum. Do not exceed a 30° angle from the straight ahead position. Connect the tow line as low as possible on the lift truck that is being towed.

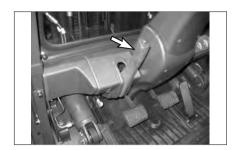
Quick lift truck movement could overload the tow line or bar and cause it to break. Gradual and smooth lift truck movement will work better.

Normally, the towing lift truck should be as large as the disabled lift truck. Satisfy yourself that the towing lift truck has enough brake capacity, weight and power, to control both lift trucks for the grade and the distance involved.

To provide sufficient control and braking when moving a disabled lift truck downhill, a larger towing lift truck or additional lift trucks connected to the rear could be required. This will prevent uncontrolled rolling.

The different situation requirements cannot be given as minimal towing lift truck capacity is required on smooth level surfaces to maximum on inclines or poor surface conditions.

Consult your DOOSAN Lift Tuck dealer for towing a disabled lift truck.



1. Release the parking brake.

NOTICE

Release the parking brake to prevent excessive wear and damage to the parking brake system.

- 2. Check that the service brake pedal is released.
- 3. Key switch is in the OFF position.
- Direction control lever is in neutral.
- Fasten the tow bar to the lift truck.
- Remove the wheel blocks. Tow the lift truck slowly. Do not tow any faster than 2 km/h (1.2 mph).

WARNING

Be sure all necessary repairs and adjustments have been made before a lift truck that has been towed to a service area is put back into operation.

Inspection, Maintenance and Repair of Lift Truck Forks

The following section gives practical guidelines for inspection, maintenance and repair of lift truck forks. It also provides general information on the design and application of forks and the common cause of fork failures.

Lift truck forks can be dangerously weakened by improper repair or modification. They can also be damaged by the cumulative effects of age, abrasion, corrosion, overloading and misuse.

A fork failure during use can cause damage to the equipment and the load. A fork failure can also cause serious iniury.

A good fork inspection and maintenance program along with the proper application can be very effective in preventing sudden failures on the job.

Repairs and modifications should be done only by the fork manufacturer or a qualified technician who knows the material used and the required welding and heat treatment process.

Users should evaluate the economics of returning the forks to the manufacturer for repairs or purchasing new forks. This will vary depending on many factors including the size and type of fork.

Forks should be properly sized to the weight and length of the loads, and to the size of the machine on which they are used. The general practice is to use a fork size such that the combined rated capacity of the number of forks used is equal to or greater than the "Standard(or rated) Capacity" of the lift truck.

The individual load rating, in most cases, will be stamped on the fork in a readily visible area. This is generally on the top or side of the fork shank.

- A fork rated at 1500 pounds at 24 inch load center will be stamped 1500X24.
- A fork rated at 2000 kg at 600 mm load center will be stamped 2000X600.

The manufacturer identification and year and date of manufacture is also usually shown.

Some countries have standards or regulations which apply specifically to the inspection and repair of forks.

Users may also refer to the International Organization For Standardization - ISO Technical Report 5057 - Inspection and Repair of Fork Arms and ISO Standard 2330 - Fork Arms-Technical Characteristics and Testing.

While there are no specific standards or regulations in the United States, users should be familiar with the requirements for inspection and maintenance of lift trucks as provided by the 29 Code Federal Register 1910.178 Powered Industrial Truck, and ANSI/ASME Safety Standard(s) B56.1 as applicable to the type of machine(s) in use.

Environment Protection

When servicing this lift truck, use an authorized servicing area and an approved container to collect coolant, oil, fuel, grease, electrolyte and any other potential environmental pollutant before any lines, fittings or related items are disconnected or removed. After servicing, dispose of those materials in an authorized place and container. When cleaning the lift truck, be sure to use an authorized area.

Causes of Fork Failure

Improper Modification or Repair

Fork failure can occur as a result of a field modification involving welding, flame cutting or other similar processes which affect the heat treatment and reduces the strength of the fork.

In most cases, specific processes and techniques are also required to achieve proper welding of the particular alloy steels involved. Critical areas most likely to be affected by improper processing are the heel section, the mounting components and the fork tip.

Bent or Twisted Forks

Forks can be bent out of shape by extreme overloading, glancing blows against walls or other solid objects or using the fork tip as a pry bar.

Bent or twisted forks are much more likely to break and cause damage or injury. They should be removed from service immediately.

Fatique

Parts which are subjected to repeated or fluctuating loads can fail after a large number of loading cycles even though the maximum stress was below the static strength of the part.

The first sign of a fatigue failure is usually a crack which starts in an area of high stress concentration. This is usually in the heel section or on the fork mounting.

As the crack progresses under repetitive load cycling, the load bearing cross section of the remaining metal is decreased in size until it becomes insufficient to support the load and complete failure occurs.

Fatigue failure is the most common mode of fork failure. It is also one which can be anticipated and prevented by recognizing the conditions which lead up to the failure and by removing the fork service prior to failing.

Repetitive Overloading

Repetitive cycling of loads which exceeds the fatigue strength of the material can lead to fatigue failure. The overload could be caused by loads in excess of the rated fork capacity and by use of the forks tips as pry bars. Also, by handling loads in a manner which causes the fork tips to spread and the forks to twist laterally about their mountings.

Wear

Forks are constantly subjected to abrasion as they slide on floors and loads. The thickness of the fork blade is gradually reduced to the point where it may not be capable of handling the load for which it was designed.

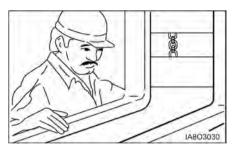
Stress Risers

Scratches, nicks and corrosion are points of high stress concentration where cracks can develop. These cracks can progress under repetitive loading in a typical mode of fatigue failure.

Overloading

Extreme overloading can cause permanent bending or immediate failure of the forks. Using forks of less capacity than the load or lift truck when lifting loads and using forks in a manner for which they were not designed are some common causes of overloading.

Fork Inspection



Establish a daily and 12 month inspection routine by keeping a record for the forks on each lift truck.

Initial information should include the machine serial number on each the forks are used, the fork manufacturer, type, original section size, original length and capacity. Also list any special characteristics specified in the fork design.

Record the date and results of each inspection, making sure the following information is included.

- Actual wear conditions, such as percent of original blade thickness remaining.
- Any damage, failure or deformation which might impair the use of the truck.
- Note any repairs or maintenance.

An ongoing record of this information will help in identifying proper inspection intervals for each operation, in identifying and solving problem areas and in anticipating time for replacement of the forks.

First Installation

 Inspect forks to ensure they are the correct size for the truck on which they will be used. Make sure they are the correct length and type for the loads to be handled.

If the forks have been previously used, perform the "12 Month Inspection".

If the forks are rusted, see "Maintenance and Repair".

- Make sure fork blades are level to each other within acceptable tolerances. See "Forks, Step 4," in the "2000 Service Hours or Yearly" in "Maintenance Intervals"
- Make sure positioning lock is in place and working Lock forks in position before using truck. See "Forks, Step 7" in the "2000 Service Hours or Yearly" in "Maintenance Intervals".

Daily Inspection

- Visually inspect forks for cracks, especially in the heel section, around the mounting brackets, and all weld areas. Inspect for broken or jagged fork tips, bent or twisted blades and shanks.
- Make sure positioning lock is in place and working. Lock the forks in position before using the truck. See "2000 Service Hours or Yearly" in "Maintenance Intervals".
- 3. Remove all defective forks from service.

12 Months Inspection

Forks should be inspected, at a minimum, every 12 months. If the truck is being used in a multi-shift or heavy duty operation, they should be checked every six months. See "Forks" in the "2000 Service Hours or Yearly" in "Maintenance Intervals."

Maintenance and Repair

 Repair forks only in accordance with the manufacturer's recommendations.

Most repairs or modifications should be done only by the original manufacturer of the forks or an expert knowledgeable of the materials, design, welding and heat treatment process.

- The following repairs or modifications SHOULD NOT be attempted.
- Flame cutting holes or cutouts in fork blades.
- Welding on brackets or new mounting hangers.
- Repairing cracks or other damage by welding.
- Bending or resetting.
- 3. The following repairs MAY be performed.
- Forks may be sanded or lightly ground, to remove rust, corrosion or minor defects from the surfaces.
- Heel sections may be ground with a carbon stone to remove minor surface cracks or defects. Polish the inside radius of the heel section to increase the fatigue life of the fork. Always grind or polish in the direction of the blade and shank length.
- Repair or replace the positioning locks on hook type forks.
- Repair or replace most fork retention devices used with other fork types.
- 4. A fork should be load tested before being returned to service on completion of repairs authorized and done in accordance with the manufacturer's recommendations.

Most manufacturers and standards require the repaired fork to be tested with a load 2.5 times the specified capacity and at the load center marked on the fork arm.

With the fork restrained in the same manner as its mounting on the lift truck, apply the test load twice, gradually and without shock. Maintain the test for 30 seconds each time.

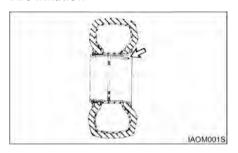
Check the fork arm before and after the second application of the test load. It shall not show any permanent deformation.

Consult the fork manufacturer for further information as may be applicable to the specific fork involved.

Testing is not required for repairs to the positioning lock or the markings.

Tire Inflation Information

Tire Inflation



WARNING

Personal injury or death could result when tires are inflated incorrectly.

Use a self - attaching inflation chuck and stand behind the tread when inflating a tire.

Proper inflation equipment, and training in using the equipment, are necessary to avoid overinflation. A tire blowout or rim failure can result from improper or misused equipment.

NOTICE

Set the tire inflation equipment regulator at no more than 140 kPa (20 psi) over the recommended tire pressure.

Tire Shipping Pressure

The tire inflation pressures shown in the following chart are cold inflation shipping pressures.

Size	Ply Rating or Strength Index	Shipping Pressure	
		kPa	psi
7.00X12 Steer	12	860	125
8.25X15 Drive	14	825	120
300X15 Drive	18	785	115
7.50X16 Drive dual	12	760	110

¹ Standard tire, ply rating and inflation pressures.

The operating inflation pressure is based on the weight of a ready - to - work machine without attachments, at rated payload, and in average operating conditions. Pressures for each application may vary and should always be obtained from your tire supplier.

NOTE: Fill tires to the recommended pressures listed ±35 kPa (5 psi). Tires can be filled with nitrogen.

Tire Inflation Pressures Adjustment

A tire inflation in a warm shop area, 18° to 21°C (65° to 70°F), will be under inflated if the lift truck works in freezing temperatures. Low pressure shortens the life of a tire.

Torque Specifications

Metric Hardware

Most of the nuts, bolts, studs, and threaded holes in your lift truck are metric. In this manual we provide specifications in both metric and U.S. customary measurement. Always replace metric hardware with metric hardware. See the parts books for proper replacement.

NOTE: For proper fit, use only metric tools on metric hardware. Non-metric tools might slip and cause injury.

Torque for Standard Hose Clamps – Worm Drive

NOTICE

The chart below gives the torques for initial installation of hose clamps on new hose and for reassembly or retightening of hose clamps on existing hose.

Clamp Width	Initial Installation Torque On New Hose		
	N-m ¹	lb-in	
16 mm (.625 in)	7.5 ± 0.5	65 ± 5	
13.5 mm (.531 in)	4.5 ± 0.5	40 ± 5	
8 mm (.312 in)	0.9 ± 0.2	8 ± 2	
Clamp Width	Reassembly Or Retightening Torque		
	N-m ¹	lb-in	
16 mm (.625 in)	4.5 ± 0.5	40 ± 5	
13.5 mm (.531 in)	3.0 ± 0.5	25 ± 5	
8 mm (.312 in)	0.7 ± 0.2	6 ± 2	

¹ 1 Newton meter (N-m) is approximately the same as 0.1 kg-m.

Torque for Standard Bolts, Nuts, and Taperlock Studs

NOTICE

The two charts below give general torques for bolts, nuts, and taperlock studs of SAE Grade 5 or better quality.

Torques for Bolts and Nuts With Standard Threads

1			
Thread Size Inch	Standard Nut and Bolt Torque		
	N·m¹	lb-ft	
1/4	12 ± 4	9 ± 3	
5/16	25 ± 7	18 ± 5	
3/8	45 ± 7	33 ± 5	
7/16	70 ± 15	50 ± 11	
1/2	100 ± 15	75 ± 11	
9/16	150 ± 20	110 ± 15	
5/8	200 ± 25	150 ± 18	
3/4	360 ± 50	270 ± 37	
7/8	570 ± 80	420 ± 60	
1	875 ± 100	640 ± 75	
1 1/8	1100 ± 150	820 ± 110	
1 1/4	1350 ± 175	1000 ± 130	
1 3/8	1600 ± 200	1180 ± 150	
1 1/2	2000 ± 275	1480 ± 200	

¹ 1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

Torques for Taperlock Studs

Thread Size	Standard Taperlock Stud Torque	
	N·m¹	lb-ft
1/4	8 ± 3	6 ± 2
5/16	17 ± 5	13 ± 4
3/8	35 ± 5	26 ± 4
7/16	45 ± 10	33 ± 7
1/2	65 ± 10	48 ± 7
5/8	110 ± 20 80 ± 15	
3/4	170 ± 30	125 ± 22
7/8	260 ± 40	190 ± 30
1	400 ± 60	300 ± 45
1 1/8	500 ± 700	370 ± 50
1 1/4	650 ± 80 480 ± 60	
1 3/8	750 ± 90	550 ± 65
1 1/2	870 ± 100	640 ± 75

¹ 1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

Torque for Metric Fasteners

NOTICE

Be very careful never to mix metric with U.S. customary (standard) fasteners. Mismatched or incorrect fasteners will cause lift truck damage or malfunction and may even result in personal injury.

Original fasteners removed from the lift truck should be checked for any damages and kept for reassembly whenever possible. If new fasteners are needed, they must be of the same size and grade as the ones that are being replaced.

The material strength identification is usually shown on the bolt head by numbers (8.8, 10.9, etc.). This chart gives standard torques for bolts and nuts with Grade 8.8.

For mounting torques of main parts, Please refer to Service manual for detail.

NOTE: Metric hardware must be replaced with metric hardware. Check parts book.

Metric ISO² Tread

Thread Size Metric	Standard Torque	
	N·m¹	lb-ft
M6	12 ± 4	9 ± 3
M8	25 ± 7	18 ± 5
M10	55 ± 10	41 ± 7
M12	95 ± 15	70 ± 11
M14	150 ± 20	110 ± 15
M16	220 ± 30	160 ± 22
M20	450 ± 70	330 ± 50
M24	775 ± 100	570 ± 75
M30	1600 ± 200	1180 ± 150
M36	2700 ± 400	2000 ± 300

¹ 1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

² ISO - International Standards Organization.

Cooling System Specifications

Coolant Information

NOTE: The following information is generic and valid for lift trucks

Engine operating temperatures have increased to improve engine efficiency. This means proper cooling system maintenance is especially important. Overheating, overcooling, pitting, cavitation erosion, cracked heads, piston seizures, and plugged radiators are classic cooling system failures. In fact, coolant is as important as the quality of fuel and lubricating oil.

NOTICE

DOOSAN recommends that the coolant mixture contain 50% commercially available automotive antifreeze, and 50% water.

The coolant mix with concentration of antifreeze smaller than 30% does not provide sufficient corrosion protection. Concentrations over 60% adversely affect freeze protection and heat transfer rates.

Never add coolant to an overheated engine, engine damage can result. Allow the engine to cool first.

If the machine is to be stored in, or shipped to, an area with freezing temperatures, the cooling system must be protected to the lowest expected outside (ambient) temperature.

The engine cooling system is normally protected to -28°C(-20°F) with antifreeze, when shipped from the factory unless special requirements are defined.

Check the specific gravity of the coolant solution frequently in cold weather to ensure adequate protection.

Clean the cooling system if it is contaminated, the engine overheats or foaming is observed in the radiator.

Old coolant should be drained, the system cleaned and new coolant added every 2000 service hours or yearly.

Refer to topic, "Cooling System - Clean, Change" in Every 2000 Service Hours or Yearly section.

Filling at over 20 liters (5 U.S. gallons) per minute can cause air pockets in the cooling system.

After draining and refilling the cooling system, operate the engine with the radiator cap removed until the coolant reaches normal operating temperature and the coolant level stabilizes. Add coolant as necessary to fill the system to the proper level.

Never operate without a thermostat in the cooling system. Cooling system problems can arise without a thermostat.

Coolant Water

Hard water, or water with high levels of calcium and magnesium ions, encourages the formation of insoluble chemical compounds by combining with cooling system additives such as silicates and phosphates.

The tendency of silicates and phosphates to precipitate out-of-solution increases with increasing water hardness. Hard water, or water with high levels of calcium and magnesium ions encourages the formation of insoluble chemicals, especially after a number of heating and cooling cycles.

DOOSAN prefers the use of distilled water or deionized water to reduce the potential and severity of chemical insolubility.

Acceptable Water		
Water Content Limits (PPM)		
Chlorides (CI)	50 maximum	
Sulfates (SO ₄)	50 maximum	
Total hardness	80mg/l	
Total solids	250 maximum	
PH	6.0 to 8.0	

ppm = parts per million

Using water that meets the minimum acceptable water requirement may not prevent drop-out of these chemical compounds totally, but should minimize the rate to acceptable levels.

Antifreeze

NOTICE

DOOSAN recommends using automotive antifreeze suitable for gasoline engines having aluminum alloy parts. Antifreeze of poor quality will cause corrosion of the cooling system, and thus always use automotive antifreeze prepared by a reliable maker, and never use it mixed with antifreeze of different brand.

DOOSAN recommends that the coolant mix contain 50% commercially available automotive antifreeze, or equivalent and acceptable water to maintain and adequate water pump cavitation temperature for efficient water pump performance.

Premix coolant solution to provide protection to the lowest expected outside (ambient) temperature. Pure undiluted antifreeze will freeze at -23°C (-10°F).

Use a greater concentration (above 50%) of commercially available automotive antifreeze only as needed for anticipated outside (ambient) temperatures. Do not exceed the recommendations, provided with the commercially available automotive antifreezes, regarding the coolant mixture of antifreeze to water.

Make proper antifreeze additions.

Adding pure antifreeze as a makeup solution for cooling system top-up is an unacceptable practice. It increases the concentration of antifreeze in the cooling system which increase the concentration of dissolved solids and undissolved chemical inhibitors in the cooling system. Add antifreeze mixed with water to the same freeze protection as your cooling system.

Use the chart below to assist in determining the concentration of antifreeze to use.

Antifreeze Concentrations		
Protection Temperature	Concentration	
Protection to -15°C (5°F)	30% antifreeze and 70% water	
Protection to -23°C (-10°F)	40% antifreeze and 60% water	
Protection to -37°C (-34°F)	50% antifreeze and 50% water	
Protection to -51°C (-60°F)	60% antifreeze and 40% water	

Specifications of Fuel and DEF/Ad-Blue

General Fuel Information

Use only the fuel recommended in this section.

NOTICE

Fill the fuel tank at the end of each day of operation to drive out moisture laden air and to prevent condensation. Maintain a constant level near the top of the day tank to avoid drawing moisture into the tank as the level decreases. Do not fill the tank to the top. Fuel expands as it gets warm and can overflow.

Do not fill the fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to the fuel system parts.

Drain the water and sediment from main fuel storage tank before it is refilled. This will help prevent water and/or sediment from being pumped from the fuel storage tank into the engine fuel tank.

Diesel Specifications

These engines utilize Tier 4 standards, the use of Ultra Low Sulfer Diesel (ULSD) is mandatory for these engines.

Diesel Fuel Specification	Location
ASTM D975 No.1D/2D S15	USA
EN590:96	EU
IS0 8217 DMX	International
BS 2869-A1 or A2	United Kingdom
JIS K2204 Grade No. 2	Japan
KSM-2610	Korea
GB252	China

Additional Technical Fuel Requirements

- Cetane Rating: The minimum recommended Fuel Cetane Rating is 45. A cetane rating greater than 50 is preferred, especially for ambient temperatures below 20 °C (4 °F) or elevations above 1500 m.
- Diesel Fuel Specification Type and Sulfer Content % (ppm) used, must be compliant with all applicable emission regulations for the area in which the engine is operated.
- DO NOT USE Fuels that have sulfer content greater than 0.0015 % (15 ppm).
- Diesel fuels specified to EN 590 or ASTM D975 are recommended.

- No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)
- These engines utilize Tier 4 standards, the use of Ultra Low Sulfer Diesel is mandatory for these engines, when operated in US EPA regulated areas. Therefore, please use No.2-D S15 diesel fuel as an alternative to
- No.2-D, and use No.1-D S15 diesel fuel as an alternative to No.1-D for ambient temperature below 10 °C (14 °F).
 - a) No.1-D or No.2-D, S15: Ultra Low Sulfer Diesel (ULSD) 15 ppm or 0.0015 wt.%

Bio-Diesel Fuels

In Europe and the United States, as well as some other countries, non-mineral oil based fuel resources such as RME (Rapeseed Methyl Ester) and SOME (Soybean Methyl Ester), collectively known as FAME (Fatty Acid Methyl Esters), are being used as extenders for mineral oil derived diesel fuels.

Doosan approves the use of bio-diesel fuels that do not exceed a blend of 5% (in volume) of FAME with 95% (by volume) of approved mineral oil derived diesel fuel. Such bio-diesel fuels are known in the marketplace as B5 diesel fuels.

These 95 diesel fuels must meet certain requirements.

- The bio-fuels must meet the minimum specifications for the country in which they are used.
- In Europe, bio-diesel fuels must comply with the European Standard EN14214.
- In the United States, bio-diesel fuels must comply with the American Standard ASTM D-6751.

Bio-fuels should be purchased only from recognized and authorized diesel fuel suppliers.

Precautions and concerns regarding the use of biofuels:

- Free methanol in FAME may result in corrosion of aluminum and zinc FIE components.
- Free water in FAME may result in plugging of fuel filters and increased bacterial growth.
- High viscosity at low temperatures may result in fuel delivery problems, injection pump seizures, and poor injection nozzle spray atomization.
- 4. FAME may have adverse effects on some elastomers (seal materials) and may result in fuel leakage and dilution of the engine lubricating oil.

- 5. Even bio-diesel fuels that comply with a suitable standard as delivered, will require additional care and attention to maintain the quality of the fuel in the equipment or other fuel tanks. It is important to maintain supplied fuels clean and fresh. Regular flushing of the fuel system, and/or fuel storage containers is necessary.
- 6. The use of bio-diesel fuels that do not comply with the standards as agreed to by the diesel engine manufacturers and the diesel fuel injection equipment manufacturers, or biodiesel fuels that have degraded as per the precautions and concerns above, may affect the warranty coverage of your engine.

General DEF/Ad-Blue Information

DEF/Ad-Blue Information

Diesel Exhaust Fluid (DEF), commonly referred to as AdBlue in Europe, is an emissions control liquid required by modern diesel engines. It is injected into the exhaust stream. DEF/Ad-Blue is never added to diesel fuel. It is a non-hazardous solution of 32.5% urea in 67.5% de-ionized water. DEF/Ad-Blue is clear and colorless, and looks exactly like water. It has a slight smell of ammonia, similar to some home cleaning agents. DEF/Ad-Blue is used in by Selective Catalytic Reduction (SCR) technology to remove harmful NOx emissions from diesel engines.

The 32.5% urea concentration is the ideal solution as it provides the lowest freeze point. Also, SCR systems will be calibrated to the 32.5%, so that optimum NOx will be reduced during operation.

DEF/Ad-Blue should comply with the following specifications. The table lists several worldwide specifications for diesel fuels.

DEF/Ad-Blue Specification	Region
IS0 22241-1	International
DIN 70700	Germany
KS R ISI 22241-1	South Korea
Certification of API	USA

A 32.5% solution of DEF/Ad-Blue will begin to crystallize and freeze at 12 deg F (-11 deg C). At 32.5%, both the urea and water will freeze at the same rate, ensuring that as it thaws, the fluid does not become diluted, or over concentrated. The freezing and unthawing of DEF/Ad-Blue will not cause degradation of the product.

CAUTION

- Make sure to wear personal protective equipment and observe precautions when handling DEF/Ad-Blue.
- Lack of DEF/Ad-Blue will reduce engine power. Check the DEF/Ad-Blue level frequently.
- Use genuine DEF/Ad-Blue that meets quality standards.
- Take care not to refill diesel fuel when replacing the DEF/Ad-Blue.
- Do not add any additives, antifreeze in particular, to prevent the DEF/Ad-Blue from freezing.
- Before operating a vehicle which has been stored for a six month period or longer, replace the DEF/Ad-Blue.

Specification

ISO 22241-1/DIN20200

100 22211 1/1011120200			
	Min	Max	
Urea Content	31.8	33.2	% by weight
Density at 20°C	1.087	1.093	g/cm³
Refracting Index at 20°C	1.3814	1.3843	
Alkalinity as NH3		0.2	%
Biuret		0.3	%
Aldehyde		5	mg/kg
Insolubles		20	mg/kg
Phosphate (PO4)		0.5	mg/kg
Calcium		0.5	mg/kg
Iron		0.5	mg/kg
Copper		0.2	mg/kg
Zinc		0.2	mg/kg
Chromium		0.2	mg/kg
Nickel		0.2	mg/kg
Aluminum		0.5	mg/kg
Magnesium		0.5	mg/kg
Sodium		0.5	mg/kg
Potassium		0.5	mg/kg

Storage

The shelf life of DEF/Ad-Blue varies by storage temperature.

Between 4°C/40°F and 26°C/80°F is recommended to maintain shelf life.

Above -11°C/12° F is recommended to avoid crystallization, which starts at -12°C/11° F.

Below 30°C/86° F is recommended, which cause hydrolysis to occur, with the consequent formation of ammonia and pressure rise, and will reduce shelf life.

Storage Temperature		Shelf life at constant Temperature
°C	°F	Months
16	60	36
27	80	12
38	100	3
49	120	1.5

Precautions for Handling

- Read manufacturer's user manual and/or precautions carefully before using DEF/Ad-Blue.
- Wash hands thoroughly after handling DEF/Ad-Blue.
- Wear appropriate personal protective equipment, including safety gloves, appropriate clothes, goggles, and face shield.
- Wash skin with plenty of water if exposed.
- 5. Take medical treatment if a large volume is swallowed.
- 6. Consult a doctor for any skin irritation.
- Wash contaminated clothes before reusing.
 If the eyes are exposed, carefully wash with flowing water for several minutes.
 - Remove contact lenses if possible.
- 9. Seek medical advice if eve irritation continues.
- **10.** Seek medical advice for any risk of exposure or contact.
- 11. The product and the container must be disposed of according to a safe procedure provided by the manufacturer.

Lubricant Specifications

Lubricant Information

Certain abbreviations follow Society of Automotive Engineers (SAE) J754 nomenclature and some classifications follow SAE J183 abbreviations.

The MIL specifications are U.S.A. Military Specifications.

The recommended oil viscosities can be found in the Lubricant Viscosities chart in this publication.

Grease is classified by the National Lubricating Grease Institute (NLGI) based on ASTM D217-68 Worked Penetration characteristics which are given a defined consistency number.

Engine Oil (DEO and EO)

The following oil specifications provide guidelines for the selection of commercial products:

- INTERIM TIER-4 Diesel Engine (V3800) TIER-4 Diesel Engine (D34NAP, D34P)
- : API CJ4, ACEA E9 or higher

NOTICE

Failure to follow the oil recommendations can cause shortened engine lift due to carbon deposits or excessive wear

Consult the EMA Lubricating Oils Data Book for a listing of oil brands.

NOTE: The percentage of sulfur in the fuel will affect the engine oil recommendations. For fuel sulfur effects, the Infrared Analysis or the ASTM D2896 procedure can be used to evaluate the residual neutralization properties of an engine oil. The sulfur products formation depends on the fuel sulfur content, oil formulation, crankcase blowby, engine operating conditions and ambient temperature.

Hydraulic Oil (HYDO)

The following commercial classifications can be used in the hydraulic system.

•	ISO 6743/4	HIVI
•	AFNOR NFE 48-603	HM
•	DIN 51524 TEIL 2	H-LP
•	HAGGLUNDS DENISON	HFO-HF2
•	CINCINNATI	P68.69.70

Viscosity: ISO VG 32

Industrial premium hydraulic oils that have passed the Vickers vane pump test (35/Q25). These oils should have antiwear, antifoam, antirust and antioxidation additives for heavy duty use as stated by the oil supplier. ISO viscosity grade of 32 would normally be selected.

NOTICE

Make-up oil added to the hydraulic tanks must mix with the oil already in the systems. Use only petroleum products unless the systems are equipped for use with special products. If the hydraulic oil becomes cloudy, water or air is entering the system. Water or air in the system will cause pump failure. Drain the fluid, retighten all hydraulic suction line clamps, purge and refill the system. Consult your DOOSAN Lift Truck dealer for purging instructions.

Transmission Oil (TDTO)

NOTICE

This oil is formulated for transmissions and drive trains only, and should not be used in engines. Shortened engine life will result.

NOTE: Multi-grade oils are not blended by DOOSAN for use in transmissions. Multi-grade oils which use high molecular weight polymers as viscosity index improvers lose their viscosity effectiveness by permanent and temporary shear of the viscosity index improver and therefore, are not recommended for transmission and drive train compartments.

NOTE: Failure to follow this recommendation can cause shortened transmission life due to material incompatibility, inadequate frictional requirements for disk materials and/or excessive dear wear.

Select the oil that meets the following specification.

- GM DEXRON III
- FORD MERCON V

Drive Axle Oil

NOTE: Failure to follow the recommendation will cause shortened life due to excessive gear wear.

Shoe Brake

Select oil that meets below specifications.

- API GL-5
- MIL-L-2105 C. D

Gear Oil offers maximum protection against the scoring and pitting of gear teeth and rolling element bearings.

Gear Oil can also provide excellent stability under high temperature conditions and has superior low temperature performance. It will also give protection against rust and corrosion.

Oil Cooled Disc Brake (OCDB)

Select oil that meets below specifications.
: Universal Transmission Tractor Oil (UTTO)

The following UTTO products of API GL4 class are authorized for use.

Supplier	Product Name
MOBIL	MOBIL FLUID 424
GS Caltex	Textran TDH Premium

Brake Fluid



Oil Cooled Disc Brake Only

Use heavy duty hydraulic brake fluid certified by oil supplier to meet the latest version of following classifications.

•	ISO 6743/4	HM
•	AFNOR NFE 48-603	HM
•	DIN 51524 TEIL 2	H-LP
•	HAGGLUNDS DENISON	HFO-HF2
•	CINCINNATI	P68,69,70

Viscosity: ISO VG32

Brake reservoir oils that have passed the Vickers vane pump test (35VQ25). These oils should have antiwear, antifoam, antirust and antioxidation additives for heavy duty use as stated by the oil supplier. ISO viscosity grade of 32 would normally be selected.

The following products are authorized for use.

Supplier	Product Name
TOTAL	AZOLLAZS
SHELL	TELLUS
MOBIL	DTE20S'
CALTEX	RANDO HD
ESS	NOTO H
CASTROL	HYSPIN AWS

Lubricating Grease (MPGM)

Use Multipurpose Molybdenum Grease (MPGM) for all lubrication points. If MPGM grease can not be used, a multipurpose type grease which contains 3% to 5% molybdenum disulfide can be used.

NLGI No.2 grade is suitable for most temperatures. Use NLGI No.1 or No.0 grade for extremely low temperature.

Lubricant Viscosities and Refill Capacities

Lubricant Viscosities

Lubricant Viscosities for Ambient (Outside) Temperatures								
						'F		
or Sy		Viscosities	Min	Max	Min	Max		
Lift Ch	nains	SAE 10W30	-20	+40	-4	+104		
API	SJ	SAE 5W30	-30	+30	-22	+86		
		SAE 5W30	-30	+30	-22	86		
		SAE10W30	-20	+30	-4	86		
Eng Crank		SAE5W40	-30	+40	-22	104		
(Die:	sel)	SAE10W40	-20	+40	-4	104		
ACE		SAE15W40	-15	+40	5	104		
		SAE15W50	-15	+50	5	122		
		SAE20W50	-10	+50	14	122		
Power Transm DEXR	nission	DEXRON III	-20	+50	-4	+122		
Hydrau	lic and	ISO VG32	-20	+30	-4	+86		
Power S Syst	teering tem	ISO VG46	-10	+40	+14	+104		
ISO 674	3/4 HM	ISO VG68	0	+50	+32	+122		
Drive Axle Housing	Disc Brake (OCDB) API GL4	UTTO (API GL4)	-20	+50	-4	+122		
		ISO VG32	-20	+30	-4	+86		
Brake Re (Only for ISO 674	OCDB)	ISO VG46	-10	+40	+14	+104		
100 074		ISO VG68	0	+50 +32 +122				

The SAE grade number indicates the viscosity of oil. A proper SAE grade number should be selected according to ambient temperature.

Capacities for Refilling

Refill Capacities-(Approximate)								
Compartment	0	Liters	U.S. Gal.					
Engine Crankcase w/Filter Diese		TIER IV (D34NAP /D34P)	13.6	3.59				
Cooling Syster w/Coolant Reservoir tank	Coolant (D34NAP 4.7		1.24					
Fuel Tank - Diesel			90.0	23.8				
DEF/Ad-blue Tank			15	4				
Power Shift Ti	ar	nsmission	13.0	3.4				
Hydraulic & Power Steering System		73.0	19.3					
Drive Axle	e Disc Brake (OCDB)		14.0	3.7				
Brake Reservoir			0.6	0.16				

Maintenance Intervals

NOTICE

Never exceed the Maintenance Intervals specified in the manual. Defects and/or damage to the important functional components may be resulted in.

NOTICE

All maintenance and repair, except Every 10 Service Hours or Daily, on the lift truck must be performed by qualified and authorized personnel only.

NOTICE

Careless disposal of waste oil can harm the environment and can be dangerous to persons. Always dispose of waste oil to authorized personnel only.

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Environment Protection
Environment Protection197

Quick Reference to Maintenance Schedule							EVI	RY		
ITEMS	SERVICES	PAGE	When Required	50-100 Service Hours or a Week	10 Service Hours or Daily	500 Service Hours or 3 Months	1000 Service Hours or 6 Months	2000 Service Hours or Yearly	2500 Service Hours or 15 Months	3000 Service Hours or 36 Months
Air Breather	Change	187					0			
Air Cleaner Indicator	Check	165			0					
Air Intake System	Change	186					0			
Air Intake System	Check, Clean	174				0				
Battery Terminal	Clean, Inspect	163	0							
Belts	Check, Adjust	177				0				
Brake Oil Level	Check	167			0					
Carriage Roller Extrusion	Check, Adjust	163	0							
Carriage Side Rollers	Lubricate	180				0				
Carriage Side Rollers Thrust (If Equipped)	Lubricate	179				0				
Carriage Sideshifter (If Equipped)	Lubricate	179				0				
Circuit Breaker		162	0							
Circulation Pump Belt (OCDB Only. If Equipped)	Check, Adjust	181				0				
Coolant Level	Check, Clean	164			0					
Cooling System	Clean, Change	192						0		
Crosshead Rollers	Inspect	179				0				
DEF/Ad-Blue Fluid Level	Check	165			0					
DEF/Ad-Blue Supply module filter replacement	Change	196								0
Drive Axle Oil	Check, Clean, Change	171		0						
Drive Axle Oil & Strainer (OCDB Only)	Check, Clean, Change	181				0				
Drive Axle Oil Level	Check	168			0					
Engine Oil & Filter	Change	169,176		0		0				
Engine Oil Level	Check	164			0					
Engine Valve Lash	Check, Adjust	156	0							
Fork	Inspect	193						0		
Fuel Filters	Check, Clean, Change	185				0				
Fuses, Bulbs & Circuit Breaker	Change, Reset	161	0							
Horn & Lights (If Equipped)	Check	182				0				
Hydraulic Oil	Check, Clean, Change	195							0	
Hydraulic Oil Level	Check	168			0					
Hydraulic Return Filter	Change	187					0			
Inching & Brake Control shaft	Lubricate	182				0				

Quick Reference to Maintenance Schedule							EVI	RY		
ITEMS	SERVICES	PAGE	When Required	50-100 Service Hours or a Week						3000 Service Hours or 36 Months
Inspect Battery System		195							0	
Inspect Engine for Fluid Leaks		164			0					
Lift Chains	Test, Check, Adjust	188					0			
Mast Channels	Lubricate	166			0					
Mast Hinge Pins	Lubricate	177				0				
Mast, Carriage, Lift Chains, & Attachments	Check, Lubricate	180				0				
Overhead Guard	Inspect	183				0				
Parking Brake	Test, Adjust	172		0						
Priming the Fuel System		157	0							
SCR Cleaning – DeSOx	Clean	158	0							
Seat, Hood Latch & Support Cylinder	Check, Lubricate	157	0							
Steer Suspension	Inspect	183				0				
Steer Wheel Bearings	Reassemble	191						0		
Steering Mechanism	Check, Lubricate	183				0				
Tilt Cylinders	Check, Adjust, Lubricate	178				0				
Tires and Wheels	Check, Inspect	162	0							
Transmission Oil Level	Check	167			0					
Transmission Oil, Oil Filter & Strainer	Clean, Change	170,187		0			0			
Universal Joint	Inspect	190					0			
Walk - Around Inspection	Inspect	166			0					
Water Separator	Drain	156	0							
Wheel Bolts and Nuts	Inspect	184				0				

When Required

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Engine Valve Lash - Check, Adjust

NOTICE

The valve clearances are to be adjusted at the times of the following situations.

- When the engine is overhauled and the cylinder heads are disassembled.
- When severe noise comes from valve train.
- When the engine is not normally operated even though there is no trouble in the fuel system.

▲ WARNING

To prevent possible injury when adjusting diesel engines, do not use the starter motor to turn the flywheel.

Hot engine components can cause burns. Allow additional time for the engine to cool before measuring valve clearance.

NOTICE

Measure the valve lash with the engine stopped. To obtain an accurate measurement, allow at least 20 minutes for the engine cylinder head and block to cool.

Set the clearance to the nominal appropriate clearance given in the "Valve Clearance Setting" chart shown below.

Valve Clearances								
Engine	Valve	Clearance						
D34NAP	Exhaust Valves	.45mm(.18in)						
D34P	Intake Valves	.40mm(.16in)						

Refer to the "Service Manual" for the complete valve adjustment procedure.

Water Separator - Drain

The water separator acts as a water trap to separate the water from the diesel fuel. If the engine fails to start or there is a loss of power, it may have to be drained.

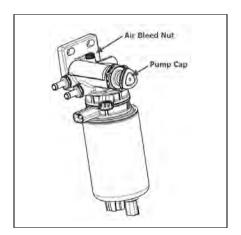
Remove plug at the bottom of the separator bowl and allow the water to drain and then install plug.



Priming the Fuel System Bleeding the Fuel System

After changing the fuel filter, or after having serviced any part of the fuel system, make sure that the air is bled from the system.

- Release the feed pump cap(rotate the cap) on the injection pump.
- 2. Release an air bleed nut on the injection pump.
- Operate feed pump until completely remove an air. Fuel will be came out through air bleed nut hole when air is completely removed.
- Lock the feed pump cap and tighten air bleed nut.
- Make sure to check & clean if there is any leakage of injection pump & filter operating feed pump many times.
- * Fuel leakage through bleed nut hole during operate feed pump is normal.



Seat, Hood Latch & Support Cylinder - Check, Lubricate



 Check the operation of the seat adjuster rod. Make sure that the seat slides freely on its track. Lightly oil the seat slider tracks if necessary.



Push the lever down to raise the hood and seat assembly. Make certain the support cylinder will hold the hood open.



Lightly oil the hood latch mechanism and the rod for the hood support cylinder.

SCR Cleaning - DeSOx

SCR Cleaning - DeSOx Display Pop-up

In order that the SCR system may maintain its exhaust cleaning efficiency at a proper level, it should be periodically initialized—"SCR cleaning."

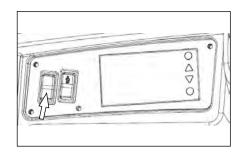
NOTICE

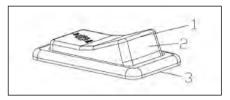
Keep monitoring the vehicle condition via the SCREEN display.

- At a workplace which is near inflammables or, heavily populated, or an indoor space, disable the SCR cleaning function.
- Be careful of the high temperature of the exhaust tube or other parts during SCR cleaning.
- Do not operate the vehicle (e.g. pushing the accelerator pedal) during SCR cleaning.
- Do not switch off the ignition during SCR cleaning.
 The SCR system might be damaged.



DOC & SCR Position





SCR Cleaning switch

Automatic SCR Cleaning

The ECU attempts to start SCR cleaning during working—"automatic SCR cleaning"—at a proper moment after determining the moment. Once automatic SCR cleaning starts, the high temperature indicator lamp lights up with a popup appearing for the operator to notice it.



Display that notifies the operator of automatic SCR cleaning

If automatic SCR cleaning is failed due to a low exhaust temperature, you should perform it after the vehicle stops. Therefore, it is recommended to keep the vehicle working as far as possible in order to ensure automatic SCR cleaning is fully completed. While automatic SCR cleaning is being carried out, exhaust emissions above 500 °C may cause fires or burns.

Setting this switch to position "3" prohibits automatic SCR Cleaning in an environment subject to dust, explosion or regulated noise level. At position "3", a popup appears as shown below:

The switch returns to the normal position of "2" after pressed by the operator to position "1". However, it does not return when pressed to position "3" and the operator shall return the switch from position "3".



SCR Cleaning inhibited

If automatic SCR cleaning is failed, you should carry it out a while after the vehicle starts working.

1) A pop-up on the SCR Display warns the operator to perform SCR Cleaning. (3 warnings: at 10 hrs remaining, 5 hrs remaining, Immediate)



Exemplary warning - 10 hrs remaining

Limit the engine power and stop the current work when SCR cleaning is not used; you will be violating the exhaust regulations if you do not.

To carry out SCR cleaning safely, observe the following steps:

- 1. Park the vehicle at a safe place. White smoke can be emitted during SCR Cleaning.
- Remove the flammable material or stained oil from exhaust system. High temperature of exhaust system and gas can cause fire.
- Engage the parking brake, and make sure the gear is in neutral.
- 4. Allow engine to warm up sufficiently; the SCR

- cleaning is not possible in cold condition.
- After holding down the switch at the "1" position for three seconds, check that SCR cleaning has started
- Once SCR cleaning finishes, the LCD display will show a notification.

Press this switch and release it after 3 sec, SCREEN Cleaning will be started and the engine speed will be increased. Screen pop-up provides information on the warning up and cleaning process.



Warming up process



Proceeding



Completed

Display for SCR Cleaning

As shown in the table below, for your information, we provide Information about correlation between Symbol and message (Display).

No	State	SYMBOL	Lamp	Message on the Display
1		= 0	-	Recommend SCR Cleaning in 10hr Need Engine Warm up
2	Request Service SCR Cleaning	=::3>	ON	Should Do SCR Cleaning in 5hr Need Engine Warm up
3		= 2	Blink	Must Do SCR Cleaning Immediately Need Engine Warm up
4	Progressing Passive SCR Cleaning Progressing Service SCR Cleaning	E3	ON	Hot Exhaust Gas
5	Service SCR Cleaning Preparation Lamp	∑ ∰	ON	Warming up for SCR Cleaning
6	Under Cleaning SCR	F)	ON	Cleaning SCR DO NOT STOP ENGINE
7	SCR Cleaning Finish		-	SCR Cleaning completed
8	SCR Cleaning inhibit switch ON	₹\$	ON	SCR Cleaning is inhibited

Fuses, Bulbs & Circuit Breaker -Change, Reset

Fuses

NOTE: If a fuse filament separates, use only the same type and size fuses for replacement. If the filament in a new fuse separates, have the circuits and instruments checked.

NOTICE

Always replace fuses with ones of the correct ampere rating.



Remove the front cover from the fuse box. The fuses are located under the air cleaner.



Fuse - Protects an electrical circuit from an overload. Opens (filament separates) if an overload occurs.

Fuse Box (Open)



Typical Example

Fuse Box (Close)



Typical Example

Fuses are identified as follows:

- Horn 10 A
- Head Lamp, Clearance Lamp, Tail Lamp 15 A Lamp Relay Coil, Fwd/Rev. Solenoid, Rear Lamp Relay & Back-up Lamp/Alarm 15 A Instrument Panel, Hour Meter, Preheat Controller,
- Fuel Shut off Solenoid 15 A
- Stop Lamp, Turn Signal Lamp, Strobe Lamp 15 A
- Starter Relay 10 A

Bulbs

Bulbs are identified as follows:

[Diesel Engine]

- 1. Bulb head lamp halogen (24V 55W)
- *2. Bulb back up (24V 10W)
- *3. Bulb turn signal (24V 25W)
- *4. Bulb stop & tail (24V 25/10W)

*Optional lamp or light

Circuit Breaker



 Raise the hood and seat assembly. Make sure the support cylinder securely holds the hood open.



Typical Example Diesel Engine Truck

The main circuit breaker is located on the rear of the support for the controls.

NOTE: To reset circuit breakers push in on the button.
The button should stay in if the breaker is reset.
If the button will not stay in, or comes out shortly
after reset, have the circuits checked.

Tires and Wheels - Check, Inspect

▲ WARNING

Servicing and changing tires and rims can be dangerous and should be done only by trained personnel using proper tools and procedures.

If correct procedures are not followed while servicing tires and rims, the assemblies could burst with explosive force and cause serious physical injury or death.

Follow carefully the specific information provided by your tire servicing man or dealer.

Check Inflation and Damage

Inspect tires for wear, cuts, gouges and foreign objects. Look for bent rims and correct seating of locking ring.

Check tires for proper inflation. See "Tire Inflation Pressures".

To inflate tires always use a clip-on chuck with a minimum 60 cm (24 inches) length of hose to an in-line valve and gauge.

Always stand behind the tread of the tire, NOT in front of the rim.



Do not reinflate a tire that has been run while flat or underinflated, without first checking to make sure the locking ring on the rim is not damaged and is in the correct position.

When tires are changed, be sure to clean all rim parts and, if necessary, repaint to stop detrimental effects of corrosion. Sand blasting is recommended for removal of rust.

WARNING

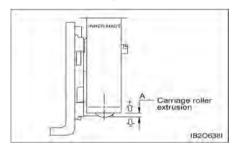
Deflate tire before removing wheel nuts from the truck.

Check all components carefully and replace any cracked, badly worn, damaged and severely rusted or corroded parts with new parts of the same size and type. If there is any doubt, replace with new parts.

Do not, under any circumstances, attempt to rework, weld, heat or braze any rim components.

Carriage Roller Extrusion - Check, Adjust

- 1. Set the mast vertical.
- 2. Lower the carriage completely.
- On full free lift and full free triple lift models, the bottom of the inner mast must be flush with the bottom of the stationary mast.



- Measure the distance from the bottom of the inner upright to the bottom of carriage bearing.
- 5. The measurement (A) must be as follows in Chart below.

Height of carriage roller extrusion (A) [unit : mm]				
STD mast	FF mast	FFT mast		
-7	43	43		

Battery Terminal - Clean, Inspect

▲ WARNING

Batteries give off flammable fumes that can explode.

Do not smoke when observing the battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear protective glasses when working with batteries.



Typical Example

Diesel Engine Truck

- 1. Clean the top of the battery and terminals.
- Check terminals for corrosion. Coat terminals with heavy grease.

Every 10 Service Hours or Daily

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Inspect Engine for Fluid Leaks

- Start the engine and allow it to reach operating temperatures.
- 2. Turn the engine off.
- 3. Inspect the entire engine for oil and/or coolant leaks.
- 4. Repair as necessary before continuing.

Engine Oil Level - Check

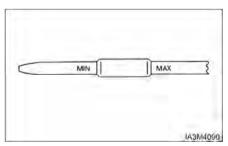
WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

 Park the lift truck on level ground, with the forks lowered, the parking brake applied, the transmission in NEUTRAL, and the engine stopped.



Raise the hood and seat assembly. Make certain the support cylinder securely holds the hood open.



The oil level should be close as possible to upper point of the oil dip stick. Do not refill more than upper point.

Coolant Level - Check, Clean

Check Coolant Level

▲ WARNING

At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

Check the coolant level only after the engine has been stopped and the filter cap is cool enough to touch with your bare hand.

Remove the filter cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.



- Observe the coolant level with engine cold. Maintain coolant level to the proper line on expansion bottle. If the expansion bottle has no coolant, it will be necessary to check coolant at the radiator filter neck.
- Remove the radiator cap. Fill radiator to the top of the filter neck. Inspect radiator cap. Replace if damaged. Install the radiator cap.



- 3. Start and run the engine to stabilize the coolant level in the filter neck. If low add coolant until it reaches the top of the filter neck. Install the radiator cap. Observe coolant level in the expansion bottle. If necessary, add coolant to bring the coolant to the appropriate line on the expansion bottle.
- 4. Stop the engine.
- Inspect the cooling system for leaks, hose cracks or loose connections.

WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

Maximum air pressure must be less than 205 kPa (30 psi) for cleaning purposes.

6. Blow any dust and lint from the radiator fins.

Air Cleaner Indicator - Check Checking Service Indicator



Typical Example

Diesel Engine Truck

- Observe the air cleaner service indicator.
- Service the air cleaner when the RED band in the service indicator, lock in the visible position. See topic, "Air Intake System - Check, Clean" in "Every 500 Service Hours or 3 Months".

NOTE: Service the element more frequently, as required, in severe dust or lint conditions. Also, service it more frequently where the operator is required to wear a respirator.

3. Close hood and seat assembly.

Inspect Engine for Exhaust Leaks

- Start the engine and allow it to reach operating temperatures.
- 2. Perform visual inspection of exhaust system.
- 3. Repair any/all leaks found.

DEF/Ad-Blue Fluid Level - Check

- Start the engine and check DEF/Ad-Blue level at the LCD.
- If DEF/Ad-Blue level is less than 20%, must refill DEF/Ad-Blue in the DEF/Ad-Blue tank.

Walk - Around Inspection - Inspect

For maximum service life of the lift truck, make a thorough walk-around inspection.

Look around and under the truck for such items as loose or missing bolts, debris or dirt buildup, fuel, oil or coolant leaks and cut gouged tires.

Have any repairs made and debris removed, as needed.



- Inspect the tires and wheels for cuts, gouges, foreign objects, inflation pressure and loose or missing bolts.
- 2. Inspect the mast and lift chains for wear, broken links, pins and loose rollers.
- Inspect the hydraulic system for leaks, wom hoses or damaged lines.
- Look for transmission and differential leaks on the lift truck and on the ground.
- Inspect the operator's compartment for loose items and cleanliness.
- Inspect the instrument panel for broken gauges and indicator lights.
- Test the horn and other safety devices for proper operation.
- 8. Inspect the cooling system for leaks, worn hoses and debris buildup.
- Inspect engine compartment for oil, coolant and fuel leaks.

10. Inspect the forks.

- Visually inspect forks for cracks, especially in the heel section, around the mounting brackets, and all weld areas.
- Inspect for broken or jagged fork tips, bent or twisted blades and shanks.
- Make sure positioning lock is in place and working. Lock the forks in position before using the truck.
 See Step 7 of " Forks " in " Every 2000 Service Hours or Yearly"
- Remove all defective forks from service.

Mast Channels - Lubricate



The channels on the roller-type mast require a break-in period. Apply a light film of lubricant on the channels where the rollers ride. This will prevent metal peel until the rollers set a pattern.

Transmission Oil Level - Check

₩ WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

- Start and operate the lift truck until the engine reaches normal operating temperature.
- Park the lift truck on level ground, with the forks lowered, the parking brake applied, and the transmission controls in NEUTRAL.
- With the brake applied and the engine at low idle, shift the directional control lever to forward and then to reverse, to fill the clutches.
- Shift the direction control lever to the NEUTRAL position.



- 5. Open the access door in floor plate.
- 6. Remove the dipstick/filter cap. Observe the oil level.
- Maintain the oil level between the Min and Max marks on the dipstick/filter cap.

When the oil temperature is 40°C approximately, the cold side mark on the dipstick is applicable. When the oil temperature is 80°C approximately, the hot side mark on the dipstick is applicable.

- 8. Close the access door in floor plate.
- 9. Stop the engine.

Brake Oil Level - Check



The brake reservoir is located on the left side of the steering column.

- 1. Remove the filler cap.
- Maintain the brake fluid level to the fluid level mark on the brake system reservoir.
- 3. Clean the filter cap and install it again.

Hydraulic Oil Level - Check

WARNING

At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil can cause burns.

Remove the filter cap only when the engine is stopped, and the cap is cool enough to touch with your bare hand. Remove the filter cap slowly to relieve pressure.

- Operate the lift truck for a few minutes to warm the oil. Park the lift truck on a level surface, with the forks lowered, mast tilted back, parking brake engaged, transmission in NEUTRAL and the engine stopped.
- 2. Raise the hood and seat assembly. Make sure the air lift cylinder securely holds the hood open.



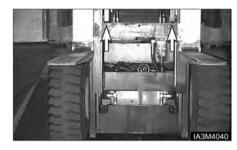
Remove the dipstick/ filter cap. Maintain the oil level to the FULL mark on the breather/dip stick.

Drive Axle Oil Level - Check

₩ WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Park the lift truck on a level surface. Apply the parking brake. The engine is at the low idle. Place the directional control level in NEUTRAL.



- Lift the carriage high enough to access the drive axle housing oil level plug and fill plug.
- 2. Put blocks under the carriage.

Oil Cooled Disc Brake (OCDB) Type



- 1. Remove the dip stick/filter cap. Observe the oil level.
- Maintain the oil level between lower mark and upper mark on the dip stick/filter cap.
- 3. Install the dip stick/filter cap.

First 50 - 100 Service Hours or a Week

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Engine Oil & Filter - Change

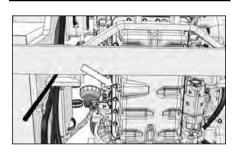
Diesel Engine Crankcase

The percentage of sulfur in the fuel will affect the engine oil recommendations. If the fuel has over 0.5% sulfur content, the CD engine oil must have a TBN of 20 times the percentage of fuel sulfur (TBN as measured by the ASTM D-2896 method). Your oil supplier should be able to furnish the correct oils.

- Operate lift truck a few minutes to warm oil. Park the lift truck with the forks lowered, parking brake applied, Transmission in neutral and the engine stopped.
- 2. Raise rear of lift truck off ground and block securely.

▲ WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.





Remove the crankcase drain plug and allow oil to drain into a suitable container. Clean and install drain plug.

- Remove and discard oil filter element.
- Wipe sealing surface of oil filter element mounting base. Make sure the entire gasket is removed.
- Before installing a new filter element, apply a small amount of clean engine oil to the filter element gasket.
- Install the new filter element. When the gasket contacts the base, tighten it 3/4 of a turn more. Do not overtighten.
- Raise the lift truck, remove the blocking and lower the lift truck.
- 9. Raise the hood and seat assembly.
- 10. Fill the crankcase. See "Refill Capacities".
- Start the engine and allow the oil to fill the filter and passages.
- 12. Check for oil leaks.
- 13. Stop the engine and measure the oil level. The oil level should be close as possible to upper point of the oil dip stick.
- 14. Close hood and seat assembly.

▲ WARNING

Do not refill more than upper point.

NOTICE

Servicing of the engine oil and oil filter element has large affects on the engine performance as well as the engine life.

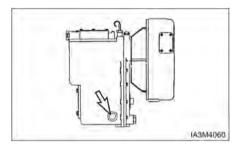
Engine oil and filter element must be changed after the first 50 hours.

Transmission Oil, Oil Filter & Strainer - Clean, Change

WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Park the lift truck on level ground, with the forks lowered, the parking brake engaged, the transmission in NEUTRAL, and the engine stopped.

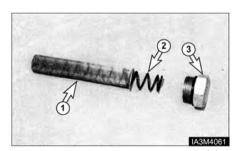


 Remove the drain plug, spring and strainer. Allow the oil to drain.

NOTICE

Careless disposal of waste oil can harm the environment and can be dangerous to persons.

Always dispose of waste oil to authorized and licensed personnel only.



- 3. Raise the hood and seat assembly.



- Remove and discard the oil filter. Wipe off the filter base. Make sure all of the old seal is removed.
- Put a small amount of clean oil on the seal on the new filter. Install the filter by hand. When the filter contacts the base, tighten it an additional 3/4 turn.
- 6. Close the hood and seat assembly.



- 7. Open the access door in the floor plate.
- Remove the dipstick/filter cap. Fill the transmission with oil. See "Refill Capacities" Install the dipstick/ filter cap.
- 9. Start the engine.
- 10. With the service brake applied and engine at low idle, shift the transmission to forward and reverse to fill the clutches.
- Shift the transmission into NEUTRAL. Apply the parking brake.
- 12. Remove the dipstick/ filter cap.
- Maintain the oil level between the Min and Max marks on the dipstick/filter cap.

When the oil temperature is 40°C approximately, the cold side mark on the dipstick is applicable. When the oil temperature is 80°C approximately, the hot side mark on the dipstick is applicable.

- 14. Check for oil leaks at the filter and drain plug.
- 15. Stop the engine.

Drive Axle Oil - Check, Clean, Change

Park the lift truck on a level surface, parking brake applied, transmission in neutral.

▲ WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.



- Lift the carriage high enough to access the drive axle housing fill plug with breather.
- 2. Block the bottom of the mast with a block of wood to hold the carriage in the raised position.
- 3. Turn the ignition switch OFF.

Oil Cooled Disc Brake (OCDB) Type



- Remove drain plug. Allow the oil to drain into a suitable container. Clean the magnetic drain plug. Check O-ring seal and replace if necessary.
- 2. Install the drain plug.



- Remove the dip stick/filter cap. Fill the drive axle housing with oil. See "Lubricant Specification - Drive Axle Oil" and "Refill Capacity"
- Start the lift truck. With the engine at low idle, place the directional control lever to the NEUTRAL.
- Maintain the oil level between lower mark and upper mark on the dip stick/filter cap.
- 6. Install the dip stick/filter cap.

Parking Brake - Test, Adjust Parking Brake Testing

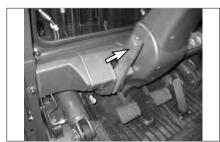
NOTICE

OSHA requires the parking brake to hold the lift truck, with capacity load, on a 15% grade.

Testing requires a test load equal to the capacity of the truck and a 15% grade.

If the maximum grade in the workplace is less than its capacity, use the Parking Brake inspection procedure covered in 'Inspection from Operator's Seat, Engine On' in "Every 10 Service Hours or Daily" section.

- Pick up capacity load and drive over to a 15% grade.
- 2. Drive forward up the 15% grade. Halfway up the grade, stop the lift truck with its service brakes.
- Engage the parking brake and slowly release the service brake.



- Engage the parking brake and shift the transmission to NEUTRAL. Slowly release the service brakes.
- 5. The parking brake adjustment is proper if it holds the lift truck on the grade. The parking brake needs adjusting if it does not hold the lift truck on the grade.
- 6. If the lift truck starts to move in reverse down the grade with the parking brake engaged, stop it with the service brakes, disengage the parking brake and reverse slowly down the grade controlling your speed with the service brakes.

▲ WARNING

To prevent personal injury, the operator MUST be ready to use the service brake if the parking brake is not adjusted correctly and the lift truck starts to move.

Parking Brake Adjusting

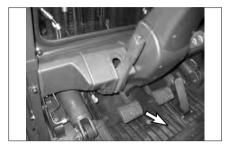
- Park the lift truck on a level surface, lowered the forks, shift the transmission to NEUTRAL and shut OFF the engine and block the wheels securely.
- Chock the lift truck's tires to prevent unintentional movement.



- 3. Remove the floor mat and floor plate.
- 4. Make sure the parking brake lever is released.



Make sure the parking brake is secured by the stop pin. 6. Remove the pin and cotter pin. Tighten the nut to more compress the spring, and pull down the Ushaped linkage while turning it. And then reinstall the pin and cotter pin, and return the nut to the Ushaped linkage.



 Loosen the locknut. Torque it to 6–7 N·m (50 to 60 lb·in). After loosening the adjusting screw 1 1/6 turns, tighten the locknut.

NOTICE

You can tighten the adjusting screw by turning it clockwise. If you turn it counterclockwise too far, parts may drop on the floor. In that case, you should disassemble transmission in order to pick up those parts.

- 8. Reinstall the floor plate and floor mat.
- Engage the parking brake, remove the tire chocks and test the parking brake. Refer to 'Parking Brake Testing' in the preceding section.

To Adjust

Park the lift truck on level ground, with the forks lowered, the transmission in NEUTRAL, the engine stopped, and the wheels securely blocked.

- 1. Release the parking brake.
- Turn the adjustment knob, clockwise to tighten the brake.
- Test the parking brake adjustment. Repeat the adjustment procedure, if necessary.

Every 500 Service Hours or 3 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Air Intake System - Check, Clean Precleaner (If Equipped)

NOTICE

Never service predeaner with the engine running.



Typical Example

Diesel Engine Truck

 Check the precleaner bowl for dirt build-up. If the dirt is up to the line, remove the precleaner bowl and empty it. Periodically wash the cover and bowl in water.

Servicing Filter Element

NOTICE

Never service precleaner with the engine running.



Typical Example

Diesel Engine Truck

Service the air cleaner when the red target in the service indicator stays locked in the visible position with the engine stopped.

 To service the air cleaner, loosen the cover latches and remove the cover.



Typical Example

Diesel Engine Truck

- 2. Rotate the element slightly to separate it from its base and remove it from the air cleaner housing.
- Clean and inspect the element or replace with a new element. See topic, "Cleaning Primary Filter Element".
- Clean the inside of air cleaner housing and the cover. Inspect all connections between the air cleaner and engine.

Check intake hose for cracks, damage and loose clamps. Tighten or replace parts as necessary to prevent leakage.

NOTICE

Do not allow dirty air to enter the intake hose when cleaning the inside of the air cleaner housing.

- 5. Check the air cleaner housing for loose latches.
- 6. Reset the air cleaner service indicator.
- 7. Install the air filter element.
- 8. Install the cover and tighten the cover latches.
- 9. Start the engine and observe the position of the indicator. If the indicator shows RED after the installation of the primary element, install another clean or a new element or, replace the secondary element. See topic, "Air Intake System - Change" in Every 1000 Service Hours or 6 months section.
- Stop the engine and close the hood and seat assembly.

Cleaning Primary Filter Elements

▲ WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

NOTICE

Do not clean the elements by bumping or tapping them.

Inspect filter elements after cleaning. Do not use a filter with damaged pleats, gaskets or seals.

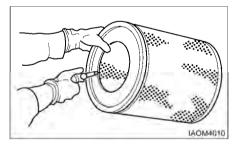
When cleaning with pressure air, use 205 kPa (30 psi) maximum pressure to prevent filter element damage.

When cleaning with pressure water, use 280 kPa (40 psi) maximum pressure to prevent filter element damage.

Have spare elements on hand to use while cleaning used elements.

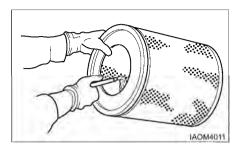
The primary element should be replaced after a year's service or after cleaning no more than 6 times.

Air-205 kPa (30 psi) Maximum Pressure



Direct air on the inside and outside of the element along the length of the pleats. Check the element for any tears, rips or damage.

Water - 280 kPa (40 psi) Maximum Pressure



Direct water on the inside and outside of the element along the length of the pleats. Air dry it thoroughly and then examine it.

Detergent

- Wash the element in warm water and mild household detergent.
- Rinse the element with clean water. See instructions in preceding topic for cleaning with water.
- 3. Air dry it thoroughly, and then examine it.

Checking Element



- Insert a light inside the clean dry element and examine it. Discard the element if tears, rips or damage are found.
- 2. Wrap and store good elements in a clean, dry place.

Engine Oil & Filter - Change

See topic, "Engine Oil & Filter - Change" in "First 50-100 Service Hours"

▲ WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.



- Remove the crankcase drain plug and allow oil to drain. Clean and install drain plug.
- Raise the hood and seat assembly.
- 3. Remove and discard oil filter element.
- Wipe sealing surface of oil filter element mounting base. Make sure the entire old gasket is removed.
- Before installing a new filter element, apply a small amount of clean engine oil to the filter element gasket.
- Install the new filter element. When the gasket contacts the base, tighten it 3/4 of a turn more. Do not overtighten.
- Raise the lift truck, remove the blocking and lower the lift truck
- 8. Fill the crankcase. See "Refill Capacities".
- Start the engine and allow the oil to fill the filter and passages.
- 10. Check for oil leaks.
- **11.** Stop the engine and measure the oil level. Maintain the oil level to the FULL mark on the dip stick.
- 12. Close hood and seat assembly.

Belts - Check, Adjust

- 1. Raise the hood and seat assembly.
- Check the condition and adjustment of the belts. Correct adjustment allows 10 mm (3/8 inch) deflection under 110N of force. (In case of Tier-4 Interim, 10 – 12 mm at 98N of force)



NOTICE

Failure to loosen the alternator mounting bolt will cause excessive stress and break the alternator mounting gear.

- To adjust the alternator drive belt, loosen adjusting bracket bolt. Move the alternator in or out as required. Tighten bolts.
- To adjust fan belt, loosen idler pulley mounting bolt.
 Move idler pulley in or out as required. Tighten idler pulley mounting bolt.
- 5. Lower the hood and seat assembly.

Mast Hinge Pins - Lubricate



Typical Example

- 1. Lower the forks and tilt the mast forward.
- Lubricate the two fittings for the mast hinge pins, one on each side of the mast.

Tilt Cylinders - Check, Adjust, Lubricate

Chassis Pivot Eyebolts



Typical Example

- Lubricate two fittings for the pivot eyebolts, one on each tilt cylinder.
- Check the pivot eye pins for loose retainer bolts and wear.

Mast Pivot Eyes



Typical Example

- Lubricate two fittings for the mast pivot eyes, one on each side of the mast.
- Check the pivot eye pins for loose retainer bolts and wear.

Cylinder Rod Extension

NOTE: The following description is for forward tilt. For cylinder rod back tilt, the collar should be stationary by the tilt eye. If it is not, the O-ring inside the collar may need to be replaced. To adjust back tilt, spacers must be added or removed.



Typical Example

- Check the tilt cylinders to make sure they extend and retract evenly.
- If one cylinder continues to move after the other cylinder has stopped in full forward or backward tilt, an adjustment must be made to one cylinder.



Typical Example

- To adjust the cylinder rod extension, move the spacer to the rear and loosen the pinch bolt on the clevis.
- 4. Turn the cylinder rod in or out of the clevis to obtain the proper adjustment. Turning the rod into the clevis shortens the stroke. Turning the rod out of the clevis lengthens the stroke. When turning for extending rod, the overlapped length between clevis's thread and cylinder rod must be minimum 32 mm
- Tighten the pinch bolts to a torque of 95 ± 15 N·m (70 ± 10 lb·ft). Check the cylinder rods again for even travel.

Crosshead Rollers - Inspect

 Operate the mast through a lift cycle. Watch the chains move over the crosshead rollers. Make sure the chain is tracking over the rollers properly.



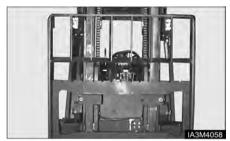
Typical Example

Check for damaged crosshead rollers, guards and retainer rings.

Carriage Side Rollers Thrust (If Equipped) - Lubricate

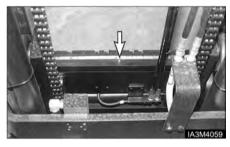


 Raise the carriage high enough to gain access to the side thrust rollers on the back side of the carriage. Block the carriage in this position.



- Lubricate 2 side thrust roller fittings, one on each side of the mast.
- Raise the carriage, remove the blocking. Lower the carriage to the floor.

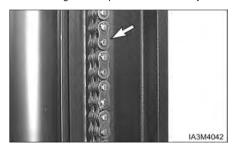
Carriage Sideshifter (If Equipped) – Lubricate



- Lubricate 4 (6) fittings. The forks may have to be moved to gain access to all of the fittings.
- Operate the sideshifter carriage through several complete cycles to distribute the grease the carriage to the floor.

Mast, Carriage, Lift Chains, & Attachments - Check, Lubricate

- Operate the lift, tilt and attachment controls. Listen for unusual noises. These may indicate a need for repair.
- Inspect for loose bolts and nuts on the carriage. Remove any debris from the carriage and mast.
- 3. Inspect the forks and attachments for free operation and damage. Have repairs made if necessary.



- 4. Brush a film of oil on all links of the chain.
- Raise and lower the carriage a few times to work lubricant into the chain links.

NOTICE

Lubricate chains more frequently than normal in applications where the lift truck is operating in a atmosphere which could cause corrosion of components or when lift truck must work in rapid lift cycles.

Inspect the chain anchors and individual links for wear, loose pins or cracked leaves.





7. In case of Full Free Lift Mast, extend the primary cylinder to full length and then check the clearance and over lapped dimension between carriage stopper bolt or block (1) and Inner mast stopper block (2). Adjust the chain anchor bolt (3) so that clearance should be 14 ± 2 mm.

And adjust the overlapped dimension to be 10 \pm 2 mm by moving or inserting washer.

Carriage Side Rollers – Lubricate





D35/40/45S-7, D50/55C-7, D40/45/50/55SC-7

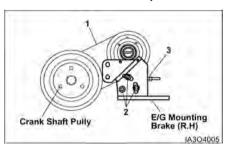
Lubricate 2 side roller fittings, one on each side of the carriage

Parking Brake - Test, Adjust

See topic, "Parking Brake - Test, Adjust" in "First 50-100 Service Hours."

Circulation Pump Belt (OCDB Only. If Eguipped) - Check, Adjust

1. Raise the hood and seat assembly.



- Check the condition and adjustment of the belt (1).
 Correct adjustment allows 10 mm (3/8 inch) deflection under 45 N of force.
- To adjust the circulation pump belt, loosen the mounting bolts (2) and adjust the adjusting inner nut (3). Tighten the adjusting outer nut (4).
- 4. Lower the hood and seat assembly.

Drive Axle Oil & Strainer (OCDB Only) - Check, Clean, Change

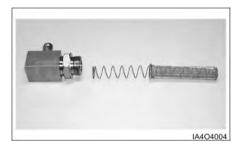
WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Park the lift truck on a level surface. Apply the parking brake. Place the directional control level in NEUTRAL and stop the engine.



- Remove drain plug. Allow the oil to drain into a suitable container. Clean the magnetic drain plug. Check O-ring seal and replace if necessary.
- 2. Install the drain plug.
- 3. Remove strainer assembly.



- Washer the strainer assembly in clean, nonflammable solvent and dry it.
- Install the strainer assembly and reconnect the hose and harness.



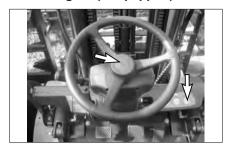
- Remove the dip stick/filter cap. Fill the drive axle housing with oil. See "Lubricant Specification - Drive Axle Oil" and "Refill Capacity".
- Start the lift truck. With the engine at low idle, place the directional control lever to the NEUTRAL.
- Maintain the oil level between lower mark and upper mark on the dip stick/filter cap.
- 9. Install the dip stick/filter cap.

Inching & Brake Control shaft - Lubricate



Lubricate two fittings for the inching and brake pedal control shaft.

Horn & Lights (If Equipped) - Check



- Press horn button, to determine if horn is operational.
- 2. Check and replace all defective gauges.
- Check all lights such as warning, directional, backup, driving and flood lights for correct operation. Replace all burned-out bulbs, and repair them if needed.

Overhead Guard - Inspect



- Check tightness of overhead guard mounting bolts at 95 N·m (70 lb-ft).
- Check overhead guard for bent or cracked sections, and repair them if needed.

Steer Suspension - Inspect



 Inspect the suspension mounting bolts. Tighten suspension mounting bolts, if necessary, to 240±30 N·m (180±20 lb·ft).



- Look for leaks at the power steering hose connections.
- Remove any trash buildup on the suspension or the steer axle.

Steering Mechanism - Check, Lubricate



- Lubricate the steer axle king pins, total of four fittings. Two on the right side and two on the left side.
- Lubricate the steering link bearings, total of four fittings. Two on the right side and two on the left side.
- Check for any worn or loose components of the steering mechanism. Remove any debris or trash as required.

Wheel Bolts and Nuts – Inspect Inspect Tightness

NOTICE

Do not lubricate ball seas of wheels or ball faces of wheel nuts.

Be sure mounting faces of hub, wheel nuts and flat mounting surfaces are clean.

Tighten wheel nuts again after 24 hours of operation.

NOTE: Always tighten wheel lug nuts in a sequence opposite (180°) each other.

If equipped with dual wheels, follow the same nut tightening sequence for both wheels.

Steer Wheels



Install steer wheel. Put two nuts opposite (180°) each other. Tighten both. Install remaining nuts. Tighten all nuts in a sequence opposite (180°) each other. Tighten to 440+35 N-m (325+25 lb-ft).

Drive Wheels



Install drive wheel. Put two nuts opposite (180°) each other. Tighten both.

Install the remaining nuts. Tighten all nuts in a sequence opposite (180°) each other. Tighten to 600±90 N·m (440±60 lb-ft).

Fuel Filters – Check, Clean, Change Diesel Engine

Park the lift truck with the forks lowered, parking brake applied, transmission in neutral, engine stopped and cool.

1. Raise up the right side cover.

▲ WARNING

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.



Typical Example

- 2. Remove the fuel filter cartridges.
- 3. Before inserting new cartridges, apply clean oil lightly to their gaskets.

NOTICE

Do not fill a fuel filter with fuel before installing it, because polluted fuel quickens the wear of the fuel system's components.

- 4. Insert new fuel filter cartridges.
- Make sure that each gasket is fitted to the sealing surface by means of turning the new cartridge.
- 6. Turn it 2/3 times more.

Every 1000 Service Hours or 6 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Air Intake System - Change Changing Primary Element

See topic, "Air Intake System - Check, Clean" in "Every 500 Service Hours or 3 Months".

Changing Secondary Element

Replace the secondary element after the primary element has been cleaned three times or yearly.

- Remove the primary air cleaner element. See topic "Servicing Filter Element". Clean the inside of the air cleaner housing and cover.
- Remove the secondary element. Inspect the gasket between the air cleaner housing and the engine inlet. Replace the gasket if it is damaged.

NOTICE

Always replace the secondary element. Do not attempt to reuse it by cleaning.

- Install a new secondary element. Install a new or cleaned primary element. Install the cover. Tighten the latches.
- 4. Start the engine and observe the air cleaner service indicator. If the indicator shows RED after installing a new secondary element and a cleaned primary (outer) element, replace the cleaned primary filter with a new element.
- 5. Stop the engine. Close the hood and seat assembly.

Fuel Lines & Fittings - Check

Visually inspect fuel lines and fittings for physical damage. Replace as required.

Hydraulic Return Filter - Change

WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Park the lift truck on level ground, with the forks lowered, the parking brake engaged, the transmission in NEUTRAL, and the engine stopped.



 Raise the hood and seat assembly. Loosen the bolts of the hydraulic tank cover, and remove the hydraulic tank cover with filter assembly.



- Remove filter assembly from the hydraulic tank cover.
- Install new filter assembly in the hydraulic tank cover.
- Inspect cover gasket for damage, replace it if necessary.
- Clean and Install the cover and tighten retaining bolts.
- 6. Lower the hood and seat assembly.

Air Breather - Change

Park the lift truck on level ground, with the forks lowered, the parking brake engaged, the transmission in NEUTRAL, and the engine stopped.

- 1. Raise the hood and seat assembly.
- Remove and discard the air breather.



- 3. Install a new air breather.
- 4. Lower the hood and seat assembly.

Transmission Oil, Oil Filter & Strainer - Clean, Change

See topic, "Transmission Oil, Oil Filter & Strainer - Clean, Change" in "First 50 - 100 Service Hours or a Week".

Lift Chains - Test, Check, Adjust Lift Chain Wear Test

Inspect the part of the chain for its normal operation over the cross head roller. When the chain bends over the roller, the movement of the parts against each other causes wears.

Inspect to make sure that chain link pins do not extend outside of the link hole. If any single link pin is extended beyond its connecting corresponding link, it should be suspected of being broken inside of its link hole. Lift chains are required to check for wear about every 1,000 service hours or 6 months.

Chain wear test is a measurement of wear of the chain links and pins. Take the following steps to check chain wear.

 Lift the mast and carriage enough for getting tension on lift chains.



Typical example

- 2. Measure precisely ten links of chain distance at the center of pins in millimeter.
- 3. Calculate chain wear rate*.
- If the chain wear rate is 2% or more, replace the lift chain.

*Chain wear rate (%)

=
$$\left(\frac{\text{Actual measurement - Pitch** X 10}}{\text{Pitch** X 10}}\right)$$
 X 100

**Chain Pitch for D35/40/45S-7, D50/55C-7, D40/45/50/55SC-7= 25.40 mm(1.0 in)

Check for Equal Tension



Typical example

Lift the carriage and the mast high enough for getting tension on lift chains. Check the chains, and make sure the tension is the same. Lift chains are required to check for equal tension about every 1,000 service hours or 6 months.

▲ WARNING

Personal injury can be caused by sudden movement of the mast and carriage.

Keep hands and feet clear of any parts that can move.

Lift Chain Adjustment



Typical example for carriage equal tension

If the tension is not the same on both chains, take the procedure as follows.

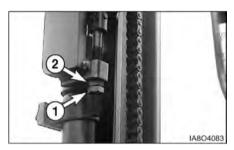
NOTE: If carriage height is not correct, make adjustments by following procedures.

Carriage Chain Adjustment

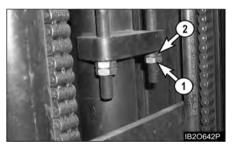
Make sure that carriage height is correct. If correct, adjust the chain for equal tension. If not, adjust the chain for correct carriage height by adjusting anchor nuts(1),(2).

NOTE: See the previous section, "Carriage Roller Extrusion" in "When Required" for proper height of carriage.

- Fully lower the carriage and tilt mast forward or lift the carriage and put blocks under the carriage to release the tension from the lift chains.
- Loosen nut(1) and adjust nut(2) to get proper distance from bottom of inner upright to the bottom of carriage bearing.



Typical example for carriage chain of STD mast



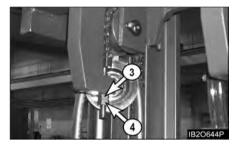
Typical example for carriage chain of FF,FFT mast

- Make adjustment anchor nut(1),(2) for equal chain tension.
- Set the mast vertical and raise the carriage and check equal chain tension. If not equal, repeat the same procedure as step 1 through step 3.
- Put LOCTITE No. 242 Tread lock on the threads of the anchor nuts(1),(2) after the adjustment is completed.

Mast Chain Adjustment - FF, FFT Mast



Typical example for FF mast



Typical example for FFT mast

Make sure that mast height is correct. If correct, adjust chain for equal tension. If not, adjust mast chain for correct mast height by adjusting anchor nuts (3), (4).

NOTE: See the previous section, "Carriage Roller Extrusion" in "When Required" for proper inner mast height.

- Lift the inner mast and put blocks under the inner mast to release the tension from the lift chains.
- Loosen nut(3) and adjust nut(4) to make inner mast rail flush with outer mast rail bottom.
- Make adjustment anchor nuts(3),(4) for equal chain tension.
- Raise the inner mast and check equal chain tension.
 If not equal, repeat the same procedure as step 1 through step 3.
- Put LOCTITE No. 242 tread lock on the threads of the anchor nuts(3),(4) after the adjustment is completed.

Universal Joint - Inspect



1. Inspect for loose retaining bolts. Check for worn or damaged bearings.



2. Have worn or damaged bearings replaced. Tighten the bolts if necessary.

Every 2000 Service Hours or Yearly

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Steer Wheel Bearings - Reassemble

Park the lift truck on level ground, with the forks lowered, the parking brake engaged, the transmission in NEUTRAL, and the engine stopped.



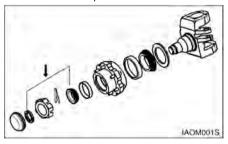
Typical Example

- Lift the steer wheels off the ground. Place stands or blocking under the frame and steer axle to support the lift truck.
- 2. Remove the hub cap.



Typical Example

3. Remove the cutter pin.



- Remove the castle nut and washer.
- Remove the wheel assembly. Examine the seal for damage and wear. Replace the seal if necessary.

WARNING

Deflate tire before removing wheel nuts at tire change.

- Remove the inner bearing. Clean and lubricate the steering knuckle. Reassemble both the inner and outer bearing cones.
- Install the inner bearing. Lubricate the seal and install the wheel assembly on the knuckle.
- Install the outer wheel bearing and the outer washer. Install a new lock washer and fit the locknut.



Typical Example

- Tighten the locknut to 135 N·m (100 lb·ft), while turning wheel hub to seat the bearing.
- Loosen the locknut. Retorque it to 50 ± 5 N·m (37 ± 4 lb·ft). Bend the lockwasher tang to secure locknut.
- 11. Install the hub cap.
- Raise the lift truck and remove the blocking Lower the lift truck to the ground.

Cooling System - Clean, Change

WARNING

At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

Check the coolant level only after the engine has been stopped and the filter cap is cool enough to touch with your bare hand.

Remove the filter cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.

Use all cleaning solutions with care.

The lift truck must be level, the forks lowered, the parking brake engaged, the transmission in NEUTRAL and the engine stopped and cool.



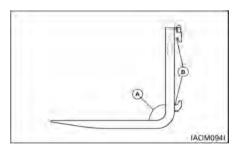
- Turn the radiator cap slowly to relieve the pressure, then remove the cap.
- 2. Remove the block drain plug.



Typical Example

- Open radiator drain valve. Allow the coolant to drain. Drain the recovery bottle.
- 4. Close radiator drain valve and install block drain plug. Fill the cooling system with 1 kg (2 lb) sodium bisulphate per 40 liters (10 gallons) of water. Most commercial cooling system cleaners can be used.
- 5. Start and run the engine for 30 minutes.
- 6. Stop the engine and drain the cleaning solution.
- Flush the system with clean water, until draining water is clear.
- Close the drain valve and install the block drain plug. Fill the system with neutralizing solution, 250g (1/2 lb) sodium carbonate per 40 liters (10 gallons) of water.
- 9. Start and run the engine for 10 minutes.
- **10.** Stop the engine and drain the neutralizing solution.
- **11.** Flush the system with clean water until draining water is clear.
- 12. Close the drain valve and install the block drain plug. Add coolant to the top of the filter neck.
- 13. Start and run the engine to stabilize the coolant level. See "Every 10 Service hours or Daily", "Coolant Level-Check", in this manual.

Forks - Inspect

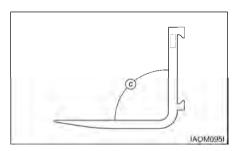


Forks should be inspected, at a minimum, every 12 months. If the truck is being used in a multi-shift or heavy duty operation, they should be checked every six months.

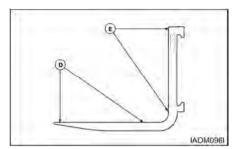
 Inspect the forks carefully for cracks. Special attention should be given to the heel section (A), all weld areas and mounting brackets (B). Inspect the top and bottom hooks on forks used on hook type carriages and tubes on shaft mounted forks.

Forks with cracks should be removed from service. "Wet Test" magnetic particle inspection is generally preferred due to its sensitivity and the ease of interpreting the results. Portable equipment is usually recommended so it can be moved to the lift truck.

Inspectors should be trained and qualified in accordance with The American Society for Non Destructive Testing, Level II Qualifications.

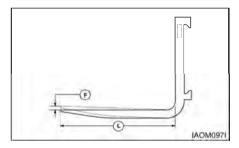


2. Check the angle between the upper face of the blade and the front face of the shank. The fork should be withdrawn from service if angle (C) exceeds 93 degrees or deviates by more than 3 degrees from an original angle other than 90 degrees, as may be found in some special application forks.



Check the straightness of the upper face of blade (D) and the front face of shank (E) with a straight edge.

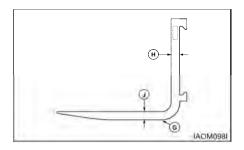
The fork should be withdrawn from service if the deviation from straightness exceeds 0.5 percent of the length of the blade and/or the height of the shank respectively 5 mm/1000 mm (0.18"/36").



4. Check the difference in height of one fork tip to the other when mounted on the fork carrier. A difference in fork tip height can result in uneven support of the load and cause problems with entering loads.

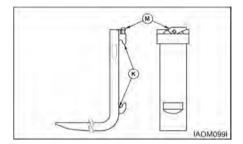
The maximum recommended difference in fork tip elevation (F) is 6.5 mm (0.25") for pallet forks and 3 mm (0.125") for fully tapered forks. The maximum allowable difference in fork tip elevation between the two or more forks is 3 percent of blade length (L).

Replace one or both forks when the difference in fork tip height exceeds the maximum allowable difference. Contact your local DOOSAN Lift Truck Dealer for further information.



Check the fork blade (J) and shank (H) for wear with special attention to the heel (G). The fork should be withdrawn from service if the thickness is reduced to 90 percent or less of the original thickness.

Fork blade length may also be reduced by wear, especially on tapered forks and platens. Remove the forks from service when the blade length is no longer adequate for the intended loads.

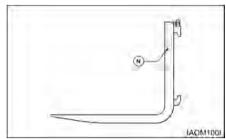


- 6. Check the fork mountings (K) for wear, crushing and other local deformation, which can cause excessive side to side wobble of the forks. Excessive clearance on hook type forks may allow them to fall from the carrier. Forks which show visible signs of such damage should be removed from service.
- Check the positioning lock and other fork retention devices to make sure they are in place and working.

Hook type forks use a spring loaded pin (M), located in the top hook, to engage notches in the top carriage bar to hold the fork in place.

When adjusting the fork spacing, the forks are prevented from sliding off the end of the carriage by stop blocks. These stop blocks are at both ends of the carriage and in the path of the bottom fork hook. The load backrest extension may be used in place of the stop blocks in some cases.

Shaft mounted forks may use set collars or spacers on the shaft to either side of the fork. They may also use U bolts, pins, or similar devices which engage the fork through the top structure of the carriage.



- Check fork markings (N) for legibility. Renew markings as required to retain legibility.
 - a. Lift the mast and operate the tilt control lever, until the top surface of the forks is parallel with the floor. Place two straight bars that are the same width as the carriage, across the forks as shown.
 - b. Measure the distance from the bottom of each end of the two bars to the floor. The forks must be parallel within 3 mm (.12 in) for Full Tapered and Polished (FTP) forks, all other forks 6.4 mm (.25 in), for their complete length.
 - c. Put one fork, one third from the tip, under a fixture that will not move. Then operate the tilt control with caution until the rear of the truck lifts just off the floor. Follow the same procedure with the second fork. Repeat Step a.

Every 2500 Service Hours or 15 Months

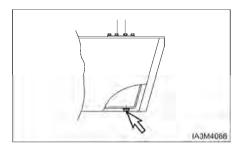
You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Hydraulic Oil - Check, Clean, Change

⚠ WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Park the lift truck on level ground, with the forks lowered, the mast tilted back (all cylinders retracted), the parking brake engaged, transmission in NEUTRAL, and the engine stopped.



- Remove the hydraulic tank drain plug. Allow the oil to drain. Clean and install the plug.
- 2. Raise the hood and seat assembly.
- Remove dipstick/filter cap. Fill the hydraulic tank. See "Refill Capacities." Install the breather/dipstick.
- 4. Lower the hood and seat assembly.
- Start the engine and operate the hydraulic controls, and the steering system, through a few cycles to fill the lines. Look for oil leaks.



Stop the engine and check the oil level. With all cylinders retracted, maintain the oil level to the FULL mark on the dipstick.

Inspect Battery System

- Clean battery outer surfaces with a mixture of baking soda and water.
- Inspect battery outer surfaces for damage and replace as necessary.
- Remove battery cable and clean, repair and/or replace as necessary.



Every 3000 Service Hours or 36 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures

DEF/Ad-Blue Supply module filter replacement (D34P Engine Only)



- Loosen the supply module plug located on the inside of frame step (LH).
- 2. Remove the filter element from the supply module.
- 3. Insert a new filter element.
- 4. Fasten with the supply module plug.

For more details, refer to the "engine service manual"

Environment Protection

When servicing this lift truck, use an authorized servicing area and an approved container to collect coolant, oil, fuel, grease, electrolyte and any other potential environmental pollutant before any lines, fittings or related items are disconnected or removed. After servicing, dispose of those materials in an authorized place and container. When cleaning the lift truck, be sure to use an authorized area.

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